FEBRUARY 25 CENTS

Science and Invention

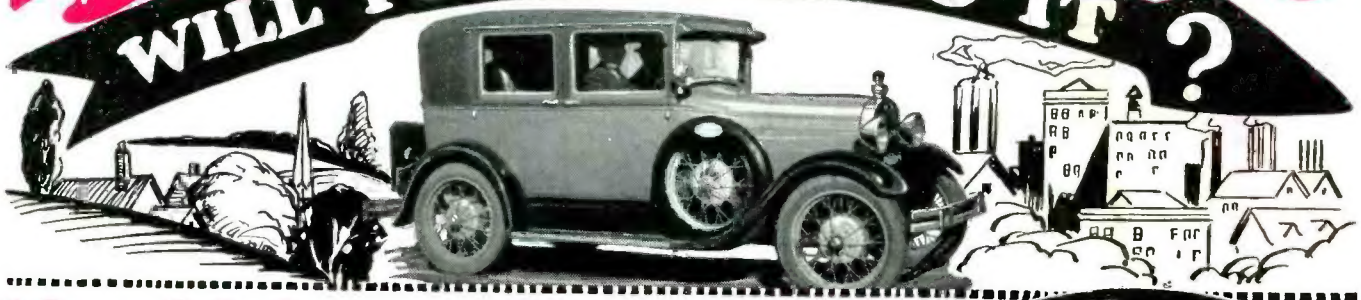
SKI-PLANING
By Dr. T. O'Conor Sloane

DIRIGIBLES OR PLANES?
By Augustus Post

When Fate Fooled "Ching Ling Foo'

42 Miles on 1 Gallon of GAS

WILL YOUR CAR DO IT ?



New Moisture Humidifier & Carbon Eliminator

for all Makes of Cars, Trucks, Tractors and Engines

An amazing Scientific Humidifier has been patented throughout the World that beats any ever got out. It makes engines run ALL THE TIME with the same wonderful efficiency they do on a cool moist night. It gives MORE pep and power, HIGHER top speed, eliminates hard carbon, and gives AMAZING mileage. Fords report 28 to 42 miles per gallon. Other makes (both American and Foreign) report marvelous increases of ¼ to double mileage. Some of the best records are:

	Miles		Miles		Miles		Miles
Buick	28¼	Essex	32	Nash	30	Pierce Arrow	22
Cadillac	21½	Ford (Model T)	42	Oakland	31	Pontiac	31
Chevrolet	41	Ford (Model A)	40	Oldsmobile	34½	Reo	26½
Chrysler	30¾	Hudson	23½	Packard	21½	Studebaker	29
Dodge	31½	Hupmobile	24½	Plymouth	29	Whippet	41
Durant	41¾	Marmon	21½	Graham-Paige	23½	Willys-Knight	29

And Hundreds of Other Wonderful Records on ALL American and Foreign Makes

Big Profits to Man with Car Spare or Full Time

$350 to $1500 a month

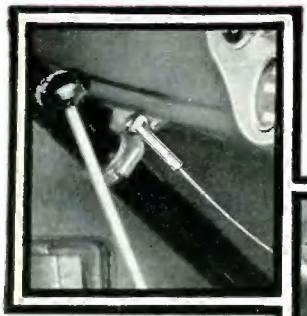
1 man $4,939.66 in 3¾ months. Another $1,656.60 in 58 days. $5,150.00 in 5 months to another. BIG MONEY can be—IS being made.

Fitting Motors With Vix

One man sold 8 first morning. Another sells all 3 men can install. Another's profits as high as $100.00 a day.

VIX sells itself by 8 STARTLING demonstrations — BIG, STUNNING, ASTOUNDING DEMONSTRATIONS. Successful VIX men make MORE MONEY than they ever made before.

Free Trial Try This New Principle Gas Saver AT MY RISK



Pictures here and at top show Model "B" VIX attached to my own New Model A Ford. This car is wonderfully improved in performance with the VIX Moisture Humidifier. So is every Auto, Truck, Tractor, Taxi, Bus, Marine, Stationary and Aircraft Engine, both American and all Foreign makes.

Try this wonderful VIX Moisture Humidifier and Carbon Eliminator AT MY RISK on YOUR OWN CAR to prove that VAPOR MOISTURE (drawn from Radiator to Engine) gives you that wonderful night driving effect ALL THE TIME with MORE mileage from gas and oil—eliminates hard carbon accumulation — gives MORE power, a SNAPPIER, PEPPIER motor. FASTER acceleration, a SMOOTHER, QUIETER running engine and HIGHER top speed.

VIX will PROVE ITS MONEY SAVING MERIT on your own car by 8 DEMONSTRATIONS—conducted by yourself AT MY RISK—the most SENSATIONAL, most ASTOUNDING, most CONVINCING DEMONSTRATIONS you ever saw. If you don't find from your tests that it does MORE than I claim, return it and it COSTS YOU NOTHING. **I want wide-awake, hustling, County, State, Province and National Agencies everywhere, part or full time, to make $350 to $1500 per month filling the great DEMAND for this wonderful invention wherever introduced. Write for my FREE TRIAL and MONEY MAKING OFFER. Use coupon below.**

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Read what BIG money these fellows have made in the RADIO BUSINESS

$375 One Month Spare Time

"Recently I made $375 in one month in my spare time installing, servicing, selling Radio sets. And, not so long ago, I earned enough in one week to pay for my course."
EARLE CUMMINGS,
18 Webster St., Haverhill, Mass.

$1597 In Five Months

"The N. R. I. is the best Radio school in the U. S. A. I have made $1597 in five months. I shall always tell my friends that I owe my success to you."
HENRY J. NICKS, JR.,
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$1164 Spare Time Profits

"Look at what I have made since I enrolled, $1,164—money I would not have had otherwise. I am certainly glad I took up Radio with N. R. I. I am more than satisfied."
HENRY R. HEIKKINEN,
123 W. Erie St., Chicago, Ill.

Over $1000 In Four Months

"My opinion of the N. R. I. course is that it is the best to be had at any price. When I enrolled I didn't know a condenser from a transformer, but from December to April I made well over $1000 and I only worked in the mornings."
AL. JOHNSON,
1409 Shelby St., Sandusky, Ohio.

I will show you too how to start a spare time or full time Radio Business of Your Own without capital

Radio's amazing growth is making many big jobs. The world-wide use of receiving sets and the lack of trained men to sell, install and service them has opened many splendid chances for spare time and full time businesses.

Ever so often a new business is started in this country. We have seen how the growth of the automobile industry, electricity and others made men rich. Now Radio is doing the same thing. Its growth has already made many men rich and will make more wealthy in the future. Surely you are not going to pass up this wonderful chance for success.

More Trained Radio Men Needed

A famous Radio expert says there are four good jobs for every man trained to hold them. Radio has grown so fast that it simply has not got the number of trained men it needs. Every year there are hundreds of fine jobs among its many branches such as broadcasting stations, Radio factories, jobbers, dealers, on board ship, commercial land stations, and many others. Many of the six to ten million receiving sets now in use are only 25% to 40% efficient. This has made your big chance for a spare time or full time business of your own selling, installing, repairing sets.

So Many Opportunities You Can Make Extra Money While Learning

Many of our students make $10, $20, $30 a week extra while learning. I'll show you the plans and ideas that have proved successful for them—show you how to begin making extra money shortly after you enroll. G. W. Page, 1807-21st Ave., S., Nashville, Tenn., made $935 in his spare time while taking my course.

I Give You Practical Radio Experience With My Course

My course is not just theory. My method gives you practical Radio experience—you learn the "how" and "why" of practically every type of Radio set made. This gives you confidence to tackle any Radio problems and shows up in your pay envelope too.

I Will Train You At Home In Your Spare Time

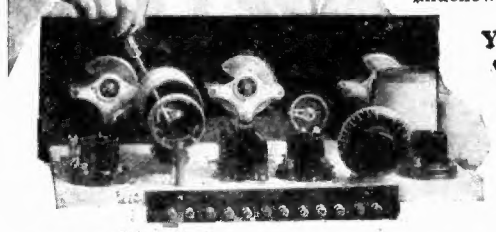
I bring my training to you. Hold your job. Give me only part of your spare time. You don't have to be a college or high school graduate. Many of my graduates now making big money in Radio didn't even finish the grades. Boys 14, 15 years old and men up to 60 have finished my course successfully.

You Must Be Satisfied

I will give you a written agreement the day you enroll to refund your money if you are not satisfied with the lessons and instruction service when you complete the course. You are the only judge. The resources of the N. R. I. Pioneer and Largest Home-Study Radio school in the world stand back of this agreement.

Get My Book

Find out what Radio offers you. My 64-page book, "Rich Rewards in Radio" points out the money making opportunities the growth of Radio has made for you. Clip the coupon. Send it to me. You won't be obligated in the least.



You can build 100 circuits with the Six Big Outfits of Radio parts I give you. The pictures here show only three of them. My book explains my method of giving practical training at home. Get your copy!

This Book points out what Radio offers you. Get a copy!

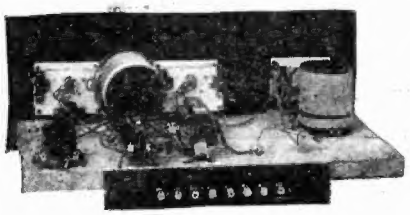
Address

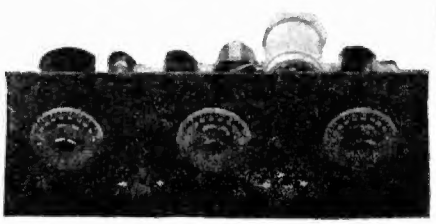
J. E. Smith, Pres.

Dept. OBS.

National Radio Institute

Washington, D. C.





This coupon is good for a FREE copy of my Valuable Book. Mail it NOW!

J. E. Smith,
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National Radio Institute, Washington, D. C.

Dear Mr. Smith: Send me your book. I want to know more about the opportunities in Radio and your practical method of teaching at home in spare time. This request does not obligate me to enroll and I understand no agent will call on me.

Name..... Age.....

Address.....

City..... State.....

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Jumping Motor Cars

How to Build the "Bremen" Airplane Model

Another Article on Glider Construction
By Lieutenant H. A. Reynolds

A New Televisor Which Uses No "Scanning" Disc

Odd and Unusual Patents

How to Waterproof Your Cellar
By Josef W. Von Stein

Newest Ideas in Aviation

WITH OUR AUTHORS

DR. T. O'CONOR SLOANE is a well-known author of popular scientific articles and also a great number of books, including one on liquid air and a number on electricity. Dr. Sloane who holds the degrees of Ph.D., and LL.D., was for many years Professor of Natural Science. He has always been interested in outdoor sports, and undoubtedly our readers will find his present article on ski-planing quite refreshing.

M. M. ROBERTS, who has written the very interesting article on how your automobile gets the third degree, has been interested in the various angles of the automobile industry for a number of years. Through his responsible position with the Olds Motor Works he knows whereof he speaks, and undoubtedly our readers will be surprised at the rigid and unusual tests through which an automobile passes, before it is passed on to the public.

H. L. WEATHERBY, who has written and illustrated so many of the articles on wood turning and home furniture construction, which have appeared right along in this journal, hardly needs an introduction to our readers, except to say that he is Instructor in Manual Training in one of the largest technical schools in the South, and he is undoubtedly one of the leading American authorities on wood-working.

SAM LOYD, whose name is undoubtedly a household word in practically every country on the globe is, without a doubt, the Puzzle King of our time. He has originated hundreds of puzzles, which, it may safely be said, have entertained presidents and kings, as well as people in every other walk of life. With Mr. Loyd the creation of a new puzzle is a real hobby—and he enjoys it thoroughly.

ROBERT H. GODDARD, Head of Department of Physics at Clark University, Worcester, Mass., is by consensus of opinion of experts, the foremost authority in America on rocket flying. A few experts in Europe have accomplished some very interesting results with rockets attached to motor cars, and also to planes, but the flights have been short, as we might expect, from what Professor Goddard has to say in his article in the March issue. He has been doing some very interesting work along the line of liquid propellant rockets, and he believes that the future of rocket flying will be based principally on experiments with this form of rocket.

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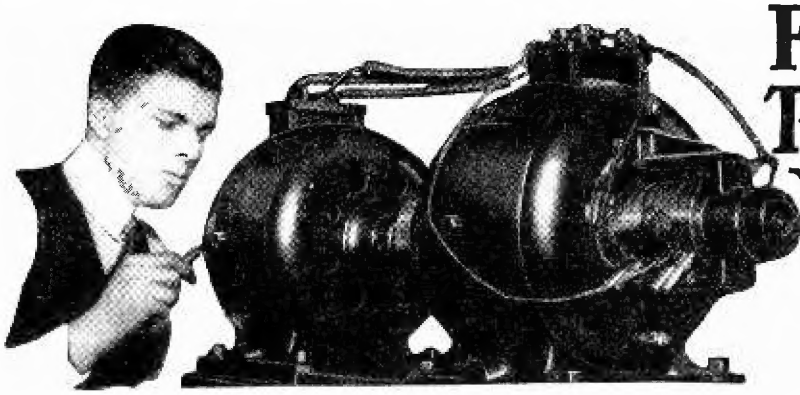

Fellows I Have Trained Will Tell You That You, Too, Can Cash In On

ELECTRICITY

Not By Correspondence

"First I enrolled with a School teaching Electricity by correspondence. I tried to work out several lessons, but quit when I saw your ad. telling how you taught Electricity by actual work. I didn't have much money when I went to Coyne, but through your Employment Department I was able to work for my room and board. Three days after graduating you got me a good job with a Battery and Electric Shop, and a year later I bought a Shop of my own. I now have a $1300 car and a thriving business—all paid for."

George W. Stoneback, Illinois.

Lands a Job at $8,000 a Year

"Before going to Coyne, I was an ordinary mechanic. Now I make $300.00 a month, and am accepting a new position the first of the year as Chief Electrician at $8,000 a year. Any man who works for me will have to be a Coyne graduate."

Stanley Zurawski, Michigan.

From $20.00 a Week to $100.00 a Week

"Before going to Coyne, I had worked in a garage for five years at $20.00 a week. I had no advanced education and didn't know a volt from an ampere. Yet I graduated in three months with a grade of 98%. Since I left Coyne, I have jumped from $20.00 to $100.00 a week, and am still going strong. I owe all my success to the practical training I got in the Coyne Shops."

Harry A. Ward, Iowa.

"I knew nothing about Electricity, before I went to Coyne," says Nolan H. McCleary. "I had no advanced education and so little money that I could never have stayed at school, if Mr. Lewis hadn't gotten me a part-time job. Yet I finished the course in twelve weeks, and the School immediately placed me in a fine electrical job. Now I am Chicago District Manager of the largest electrical concern of its kind in the world, making more money than I ever dreamed of making before I went to Coyne. I am convinced that there is but ONE RIGHT WAY to learn electricity and that

NOLAN H. McCLEARY
Chicago District Manager, Beardsley-Wolcott Co.

is the way of the Coyne School—BY DOING ACTUAL ELECTRICAL WORK YOURSELF UNDER EXPERT INSTRUCTORS, ON FULL-SIZE, RUNNING ELECTRICAL MACHINERY AND EQUIPMENT."

For thirty years Coyne has been training men for responsible, Big-Pay electrical jobs—NOT BY BOOKS OR CORRESPONDENCE, but by an amazing way to teach that makes you a practical Expert in 90 days. You need no advanced education or previous experience. I don't care if you don't know an armature from a generator; if you're sixteen years old or forty. IT MAKES NO DIFFERENCE! I will prepare YOU for a fascinating, Big-Pay electrical job in twelve weeks time. I will allow you your railroad fare to Chicago—help you get part-time work while at School—and give you every assistance in locating just the job you want when you graduate.

Says You Can Make $60.00 to $200.00 a Week

"Before going to Coyne, I made thirty cents an hour. I borrowed the money for my tuition and you got me a part time job that took care of my expenses. I graduated in twelve weeks, returned home and started doing wiring on contract. In a year's time, I had paid for my schooling, bought a car and had a nice shop of my own. In your catalog you say a fellow can make $60.00 to $200.00 a week. I have done better. In July I made $150.00 to $200.00 a week, and I have made as high as $75.00 a day."

Joseph F. Hartley, West Virginia.

His Advice—"Go To Coyne"

"Some fellows try to learn Electricity by just working at it. Others send away for correspondence courses in it. But my advice to anyone who really wants to learn Electricity is TO GO TO COYNE. They have all the electrical equipment right in the school that you will ever see in the field. NO PICTURES OR USELESS THEORY. They show you just how to do everything you will have to do on the job."

R. M. Ayers, Louisiana.

Nothing Compares to Practical Training

"Before going to Coyne, I took a correspondence course in Electricity, but it was too deep for me and I lost interest. Then I got your catalog, saw how you let the student actually work on electrical equipment, and decided to go to Coyne. At that time I was only making $9.00 a week. Now I make $68.00 a week straight time, have a Hudson car and own my home—where before I could hardly pay rent."

D. G. Emerson, Michigan.

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Find out how QUICKLY and EASILY you can land a Big-Pay Electrical Job! IT COSTS NOTHING TO INVESTIGATE! Just mail the coupon and let me send YOU the same Big Free Book that started all these other fellows on the road to success. This doesn't cost you a cent, nor does it obligate you in any way. GET THE FACTS. Mail the coupon—NOW!

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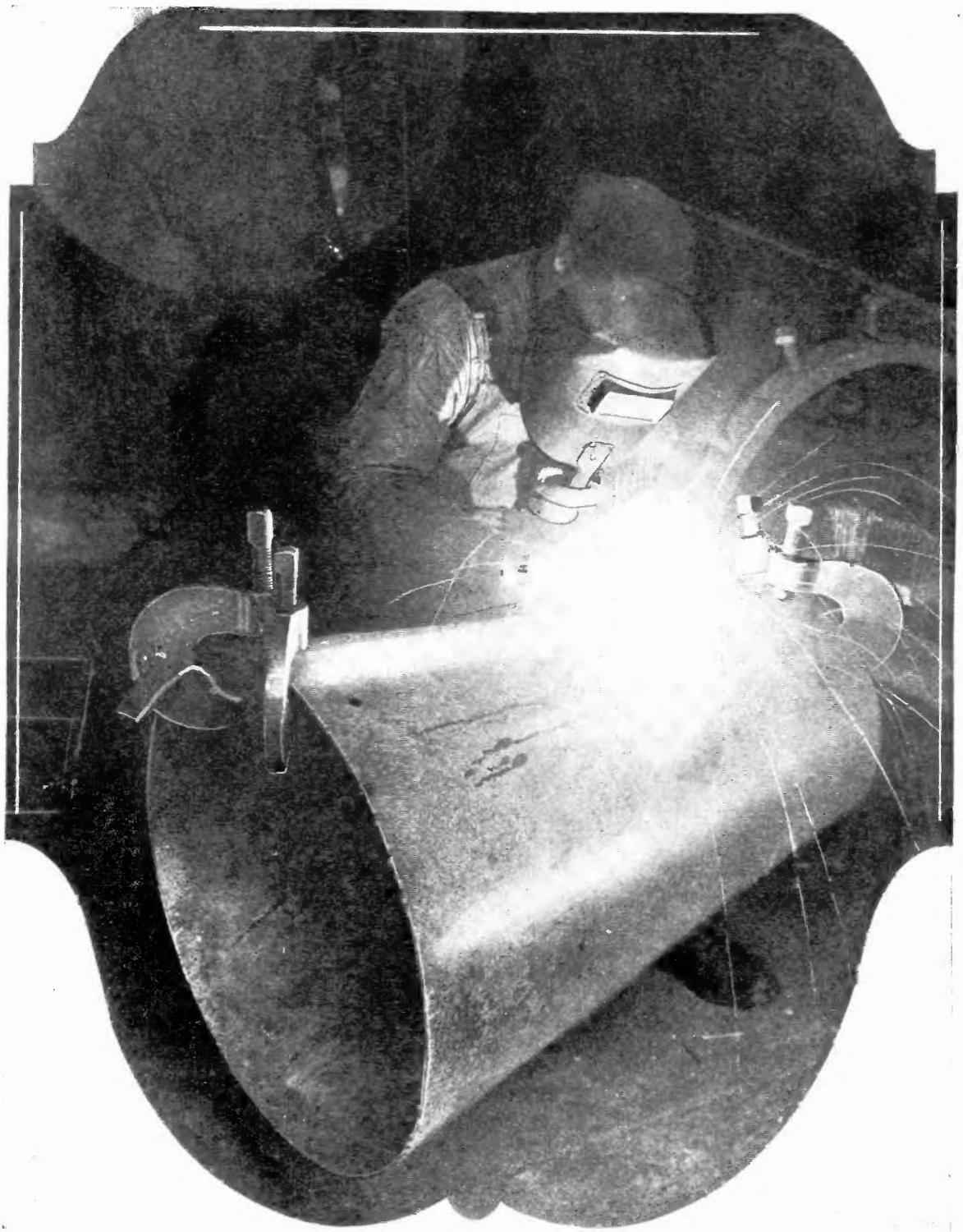

Magic Electric Wand Joins Metals

THE electric arc welder is beginning to supplant the famous riveter who has been so intimately linked with metal construction and repair work. The man shown in the picture above is using an electric arc to fuse iron, in making repairs on a Coast Guard buoy at Staten Island, New York. By utilizing similar electric arc welding methods, steel frame buildings of several stories have now been constructed, and a careful check on the strength of the steel framework so constructed without any rivets, but with arc-welded joints instead, have shown them to compare very favorably indeed with the old style of riveted construction. In some cases arc-welded joints have been found to be stronger than riveted joints. The arc welder, as shown in the picture, wears a protective mask over the face with a suitably colored glass window in it, to protect the eyes against the intense glare from the arc.

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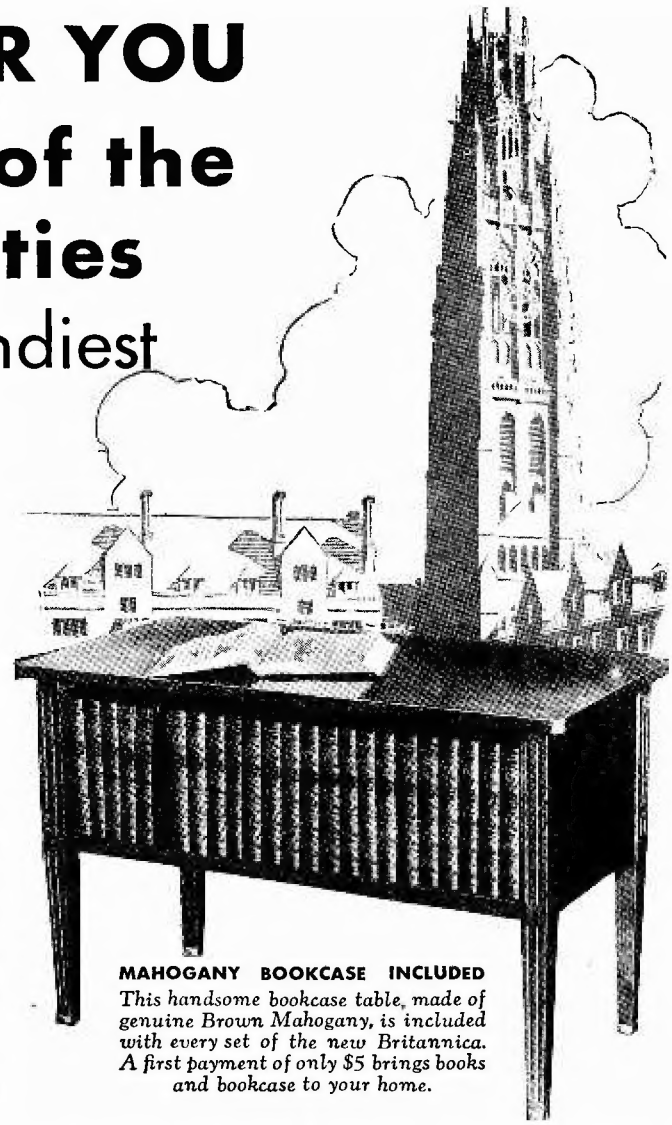

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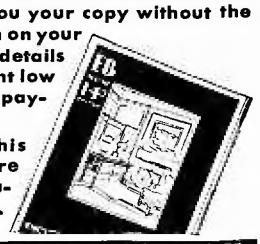

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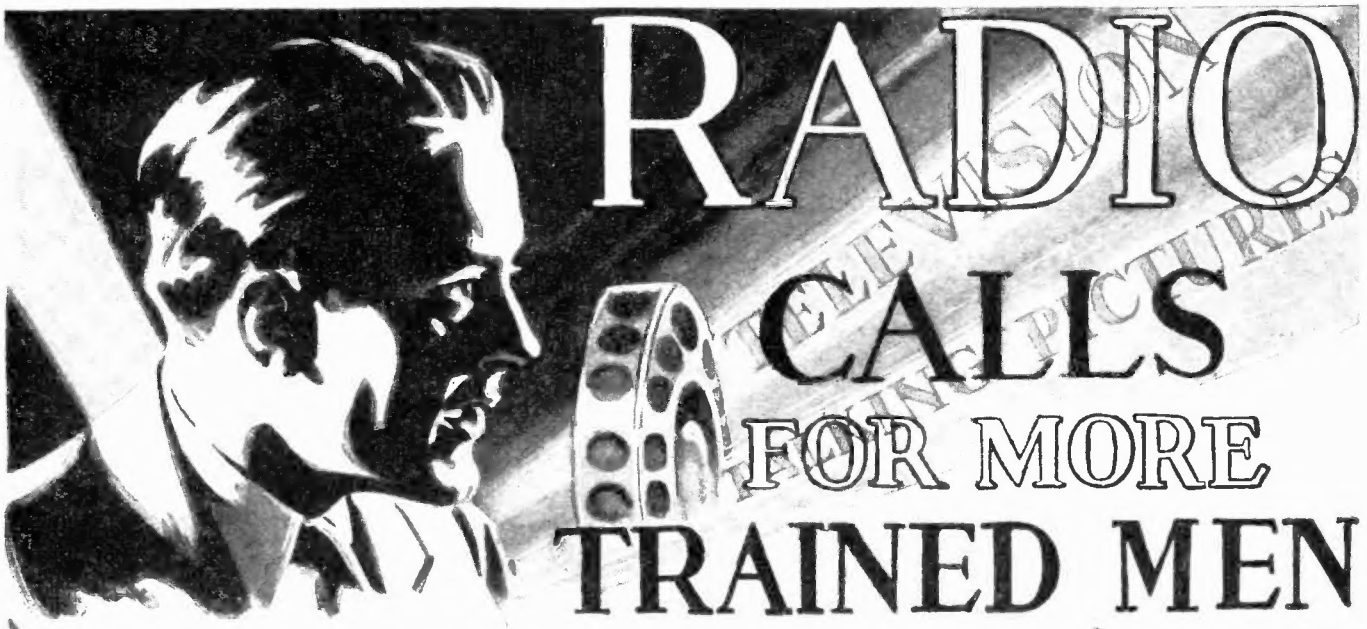

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Big Money quick—the chance to more than double your salary—is offered to you now. RADIO has leaped from the experimental stage to a gigantic industry, employing many, many thousands and loudly calling for MORE TRAINED MEN to fill the Big-Pay jobs.

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Big Money Now! More to Come

Here is an entirely new field of profitable employment—Big-Money Jobs—$2500—$3500—$5000 and up, right now—lots of money easily made in spare time—increasing pay for you and more and more money as this new industry grows bigger and bigger.

$500 in 2 Months Hasn't Finished the Course

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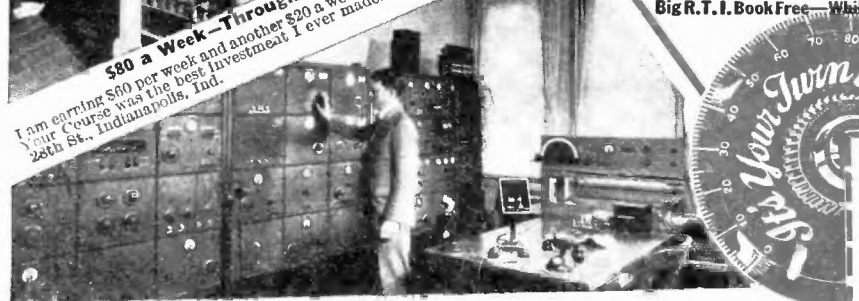

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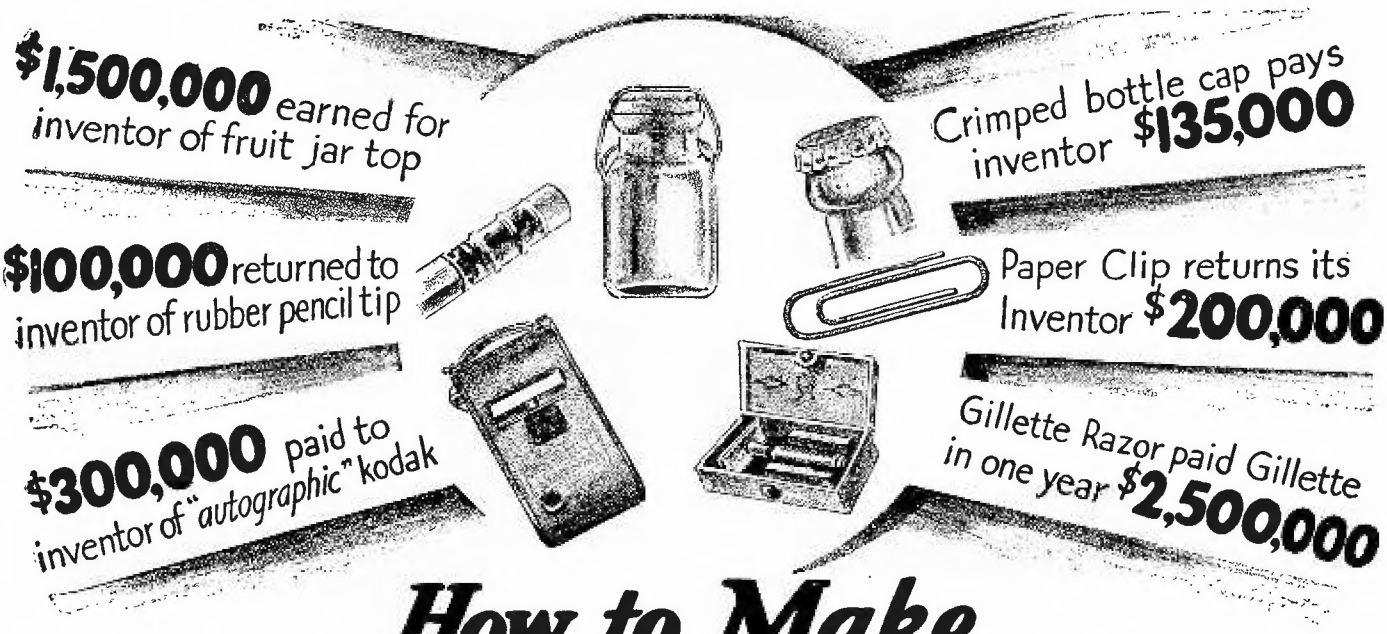
$1,500,000 earned for inventor of fruit jar top
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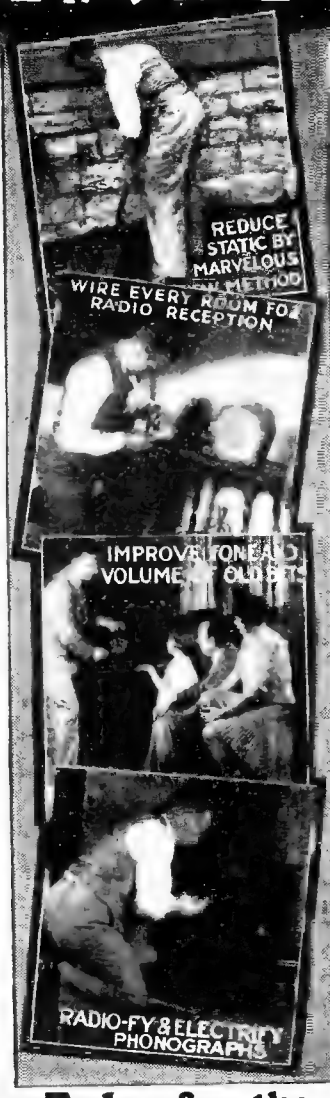
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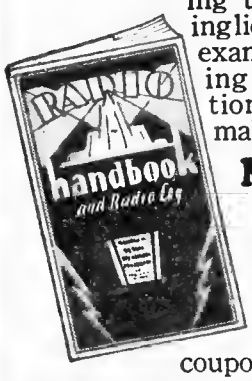

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FEBRUARY, 1930
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Editorial

. . . BYRD'S SOUTH POLE FLIGHT. No single achievement within recent times has been more interesting from a scientific viewpoint than the perfect flight made by Commander Byrd and his associates over the south pole. We believe that the readers of SCIENCE AND INVENTION have a much keener appreciation of the Byrd flight than the average man. It is almost impossible to think of any branch of science which has not been called into play in the fulfillment of Byrd's epoch-making adventure. Here we find aeronautics well represented in one of the latest types of planes and in the latest type of instruments for use in the planes. In the plane which was used in the flight we find the application of advanced study in applied mechanics, metallurgy, electricity, chemistry, photography, and mechanics.

The present south polar expedition is a real application of scientific progress, but the two most interesting sciences applied in it—those which appeal to our sense of the romantic, are aviation and radio. Radio messages from the Byrd plane were being received in many parts of the world simultaneously, while Byrd with his associates was hovering directly above the pole. In fact, the actual time which transpired from the time Byrd's message was started on its way, to the time it was actually received in New York, was approximately one-tenth of one second. The flight is now history. It marks a milestone in scientific progress. It is interesting to speculate where applied science is likely to take us, within the next few years.

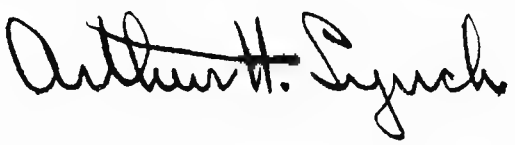
* * *

. . . HOME TALKIES. One of the most rapidly developing forms of home entertainment is amateur talking movies. Recording and reproducing is an extremely interesting and rather inexpensive hobby. Within the past few months new photo-electric cells and new amplifying devices have been perfected which will enable the home *talking movie* fan to avail himself of the most recent advances in this art. By the use of comparatively insensitive microphones and amplifiers, which can be counted upon to reproduce over the entire voice range equally well, it is possible to make recordings either on wax or on film, which will be free from the background hiss, which up to now has tended to reduce the realism of the amateur's work along this line. Details of some of the simple systems we have seen will soon be published in the pages of SCIENCE AND INVENTION, and we feel sure that our readers will be more than satisfied with the results it is possible for them to obtain from the application of these ideas.

* * *

. . . MUD FLYING FIELDS. A great many of the existing airports are in locations which will render them unsuitable for the type of flying which is likely to be here within the next few years. In other words, many of the present day flying fields are located close to our large cities, and if not entirely surrounded, are partially surrounded, by high buildings, power lines or high hills.

There are a great many swampy meadows near some of our large cities which would make ideal flying fields. In order to use them satisfactorily, it is but necessary to reclaim this swamp land by the process which is so completely described on another page in this issue. Suitable flying fields take up so much room that this system offers some real possibilities, not only in conserving the land which should normally be used in our building programs, but also in bringing into use that swamp land, which up to the present time has been useful only for the breeding of disease and mosquitoes, the infectors of malaria and, in the tropics, of yellow fever.



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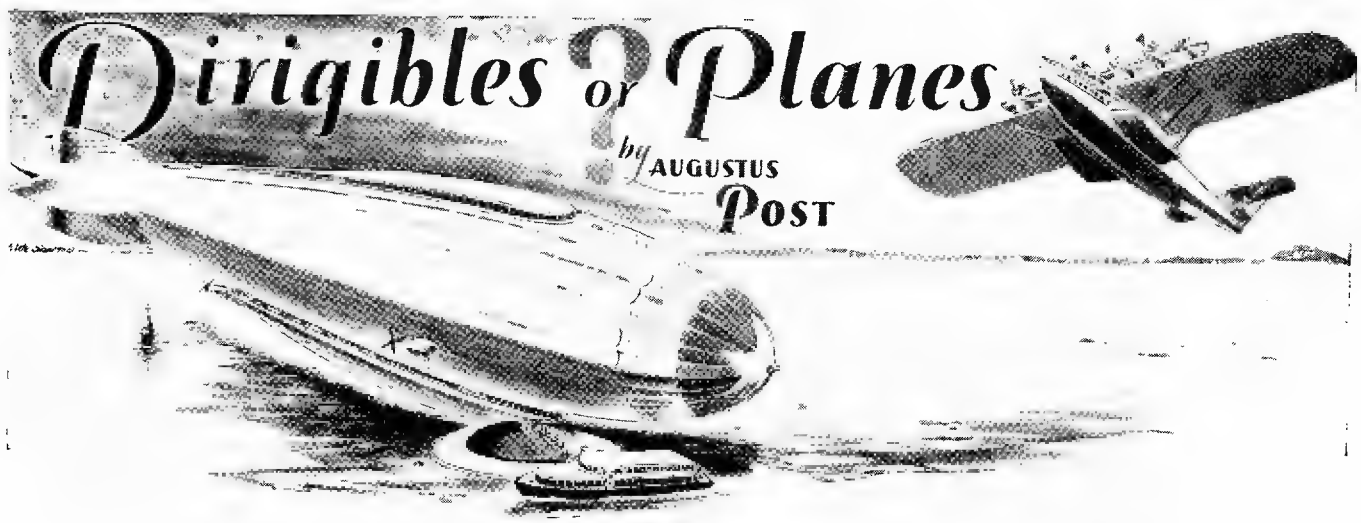
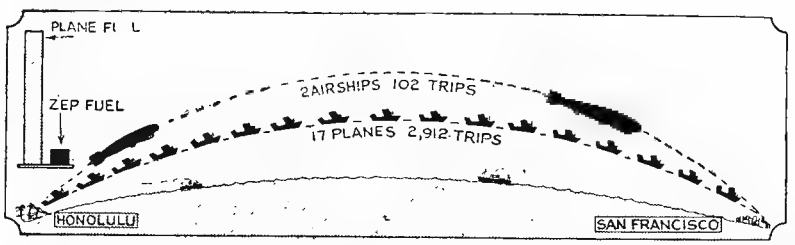


The dirigible landing station shown above is one of the newest German ideas—note the equalizer hanging from the stern.

THE perennial question "Which is the better, airship or airplane?" was never more important than at the present moment and the advantages of both are rapidly falling into definite channels and taking shape in commercial form.

Stating the situation in its broadest, simplest form, the airplane has speed on its side while the airship possesses great radius of action. The airplane, of course, must be considered in two types: the land machine and the flying boat. In the matter of speed we have seen that the airplane has far outstripped landing-facilities. The Schneider Cup Race machines, going 368 miles an hour, require landing areas offered only by broad stretches of water. In the same way, the largest airplanes are flying boats (for example; the DO-X, carrying 169 passengers) because it seems impractical to have such tremendous weights taking off and landing from the ground, and if concrete landing fields are essential, a forced landing would be fatal, whereas of course, a flying boat can negotiate an emergency landing anywhere over the water, lake, ocean or river. Speed needs water, and size needs water, so the development of the gigantic commercial transport airplanes is toward the flying boat, as would seem to be the logical procedure.



To transport 2,912,000 pounds per annum from 'Frisco to Honolulu, would require but 2 airships making 102 trips one way; 17 57-ton flying boats would be required to make 2,912 trips one way per annum.

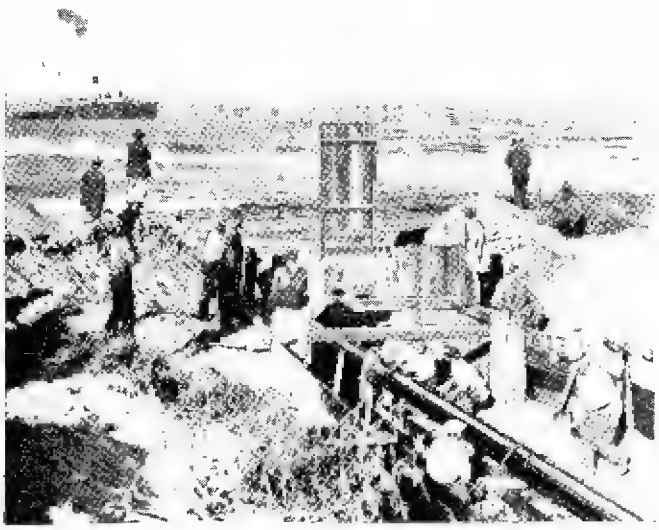
FOR trans-oceanic and other long flights where passengers and freight are to be carried, the dirigible would seem to be superior. The pay load for a seaplane is 2 2/3 ounces for each horsepower and 3½ pounds in the airship. The fuel cost per pound of mail carried by plane is $1.85 for trans-Pacific service and 10c by airship. The efficiency of an airship increases with size; for planes the efficiency rises but little with greater size.

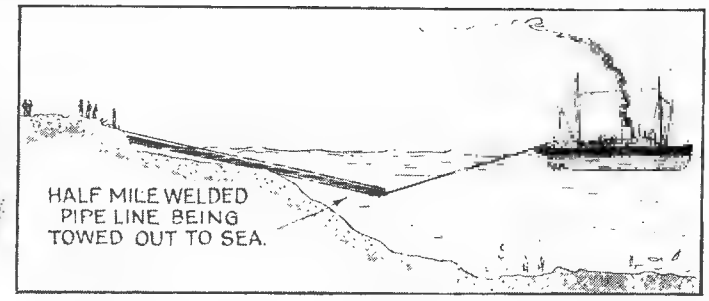
This, however, is comparatively limited in its range of action. The main reason why the plans of the German Lufthansa for the establishment of regular trans-Atlantic airplane service between Europe and South America have been delayed, is that the longest leg—between Cape Verde and Fernando Noronha, a distance of about 1500 miles—cannot as yet be covered by a large commercial plane, for the radius of the present machine is not sufficient. A range of less than 500 miles for a machine of 60,000 pounds weight is estimated by no less an authority than Dr. Rohrbach, builder of some of the largest German airplanes. The only existing machine that could be depended upon to cover the Cape Verde—Fernando Noronha lap would be the DO-X, which would probably have to be altered for the purpose by adding an extra tank for fuel, which would also reduce the useful load. It is generally admitted that the percentage of useful load will tend to decrease with increase in size. This decrease may be arrested for the time being, by increasing the wing loading per unit of area as the size increases, but it cannot be quite done away with. A five hundred mile range for the 60,000 pound flying boat is all that some authorities predict. With the airship, on the other hand, the efficiency increases with the increase of the size, up to between ten and fifteen million cubic feet size and about 300 tons lift. On the occasion of the launching of the R-101, the editor of the English review *Airways* said: "By its very nature, the airship is a long-distance, weight-carrying aircraft, proving most efficient and economical in the commercial sense when engaged on long journeys and traveling continuously by day and by night." Commander Burney, designer and builder of the R-100, says, "Over long distances, the airship is safer, more economical and more comfortable than the airplane. For short distances—up to five hundred miles—the airplane is, and always will be, superior to the airship."

Interesting comparison between the freight rate by airship of $3.50 per pound for trans-Pacific service and airplane rate of $11.12 per pound. Passenger rates, same ratio.

In Europe it has been found that airplane travel at 100 miles an hour, at a fare slightly greater than that of the railway, will attract traffic from the railways. The tendency is to make the machines carry more passengers rather than to make them go faster: this means increasing the paying load rather than increasing

(*Continued on page* 951)

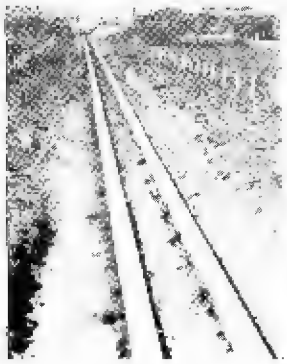




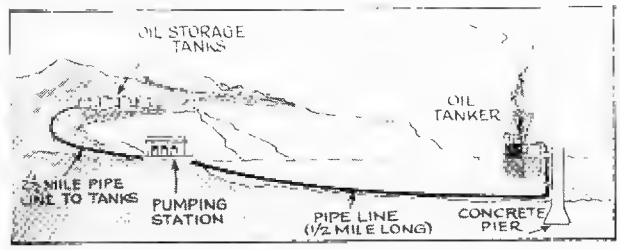
Oil Pumped From One-Half Mile Off-Shore

A "PLUS ULTRA" in sales service was developed in Santa Cruz by the General Petroleum Corporation of California to supply fuel to the giant Santa Cruz Portland Cement Company's plant 17 miles from that city. A pipe line one-half mile long and solidly welded into a single line was laid on the floor of the Pacific Ocean. This unique project, the only one of its kind in North America, permits tankers to discharge cargoes to a shore pumping station which will force 3,000 barrels per hour into storage tanks with a capacity of 7,434,000 gallons, located two and a half miles inland. To lay the pipe line, it was necessary to build it complete on shore, mount it on sleds and, over a thickly greased runway, tow it to sea with the aid of a tug. At a distance of about three thousand feet from the shore the pipe was connected to the storage tanks of the ship delivering the oil. The operation was finished in an hour.

Sleds under the huge pipe were cut away as it slid down the runway, which, as may be seen in the photo to the left, looks like a long railroad track. The photo shown above illustrates the method of bringing the pipe-line to the bed of the ocean. A tug towed the pipe one-half mile out from this spot to connect it to the tanker lying off-shore.



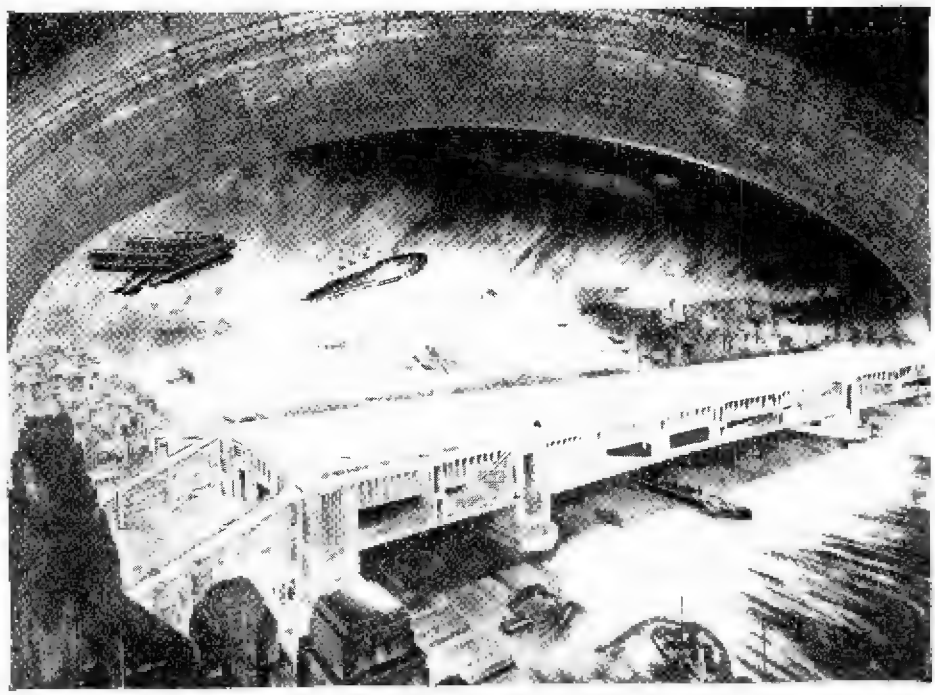
Below — sectional view of pipe line ½ mile out to sea.



An oil tanker lying one-half mile off-shore, by means of a flexible connection, can pump oil through the underwater pipe line to the shore stations.

Planes *May* Land *on* Covered Bridges

IN our rapidly growing cities the problem of transportation is most difficult to solve. Commuting facilities and those for freight traffic fail to meet the requirements of the modern city. At present the roads are hopelessly overcrowded with vehicles of every description, and those who daily commute to some large center of business know only too well the deplorable conditions existing in our subways, elevated roads and trains. Elevated walks and highways have been suggested as a means for eliminating congestion, both pedestrian and vehicular.



Covered bridges may serve as landing platforms for aircraft in the city of the future.

The illustration reproduced here shows an elevated covered bridge spanning a waterway. Such a structure would provide tracks for trains and trolleys as well as roads for automobiles and pedestrians. The top would be covered over and offer a smooth runway for landing and taking-off airplanes. It would also be possible to land dirigibles on the top of the bridge, as shown in the artist's conception of the future city.

Let's Go Ski-Planing

by Dr. T. O'Conor Sloane

A Distinct Novelty In Winter Sports Is Here Presented And Combines The Art of Gliding With That of Skiing.

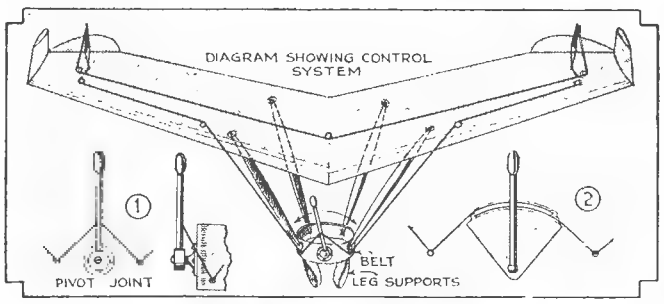
The ski-plane taking off.

GLIDERS have been flown in various ways, such as by running down a hill until the glider attains sufficient flying power to lift its occupant along with it; in other cases gliders have been towed by an automobile until its wings found sufficient lifting power in the air to sustain its pilot, the tow rope then being cast loose, after which a considerable distance can be negotiated by the glider.

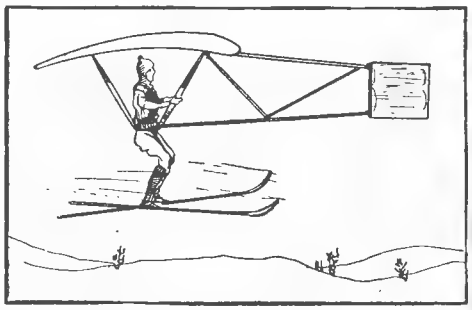
This new sport of ski-planing which I am here presenting should find great favor with all devotees of outdoor winter sports. Almost any kind of glider will do, but the tailless type here illustrated most prominently is ideally suited to this new sport, as there is no tail to drag down on the ski-slide. Another way of obviating the tail difficulty, if a straight-wing glider of the orthodox type is to be used, is to place the tail in front of the glider, as one of the accompanying illustrations shows—on the same order as the early airplanes which frequently had the tail or stabilizer in the front instead of behind.

One of the pictures herewith shows a German tailless glider of the power type; that is, it is fitted with a small engine in the rear, together with a propeller, so that once the glider is launched into the air, the pilot can negotiate a much longer flight than he could with an engineless glider. The picture at the bottom of this page shows the increased span which can be jumped with skis after coming down when the glider is used. In other words, this scheme amounts to a new way of launching a glider. Recently an airplane was launched from a special framework built up around a sedan automobile, and this is another suggestion for glider enthusiasts. Working drawings for building gliders have appeared in past numbers of this magazine, notably in the June, July and August; also in this issue.

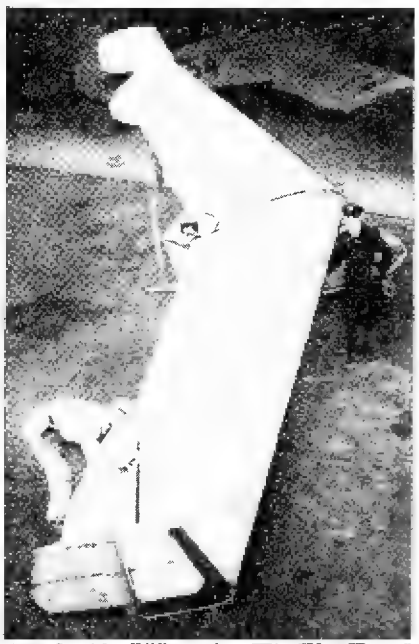
For the purpose of ski-planing the glider does not necessarily need to have a very large wing spread as is the case (*Continued on page* 949)

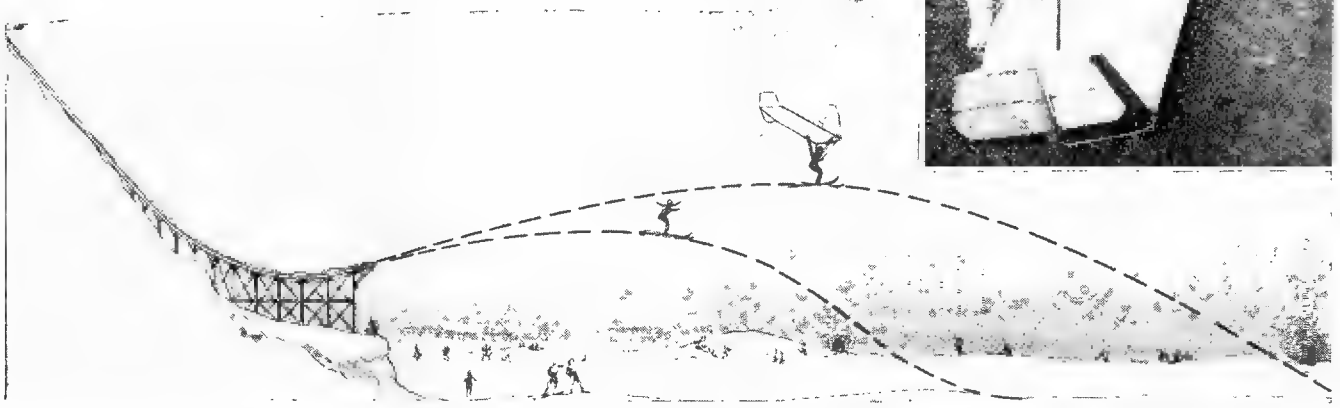


Above—Arrangement of simple controls on the ski-plane. Photo at right—tail-less German power glider

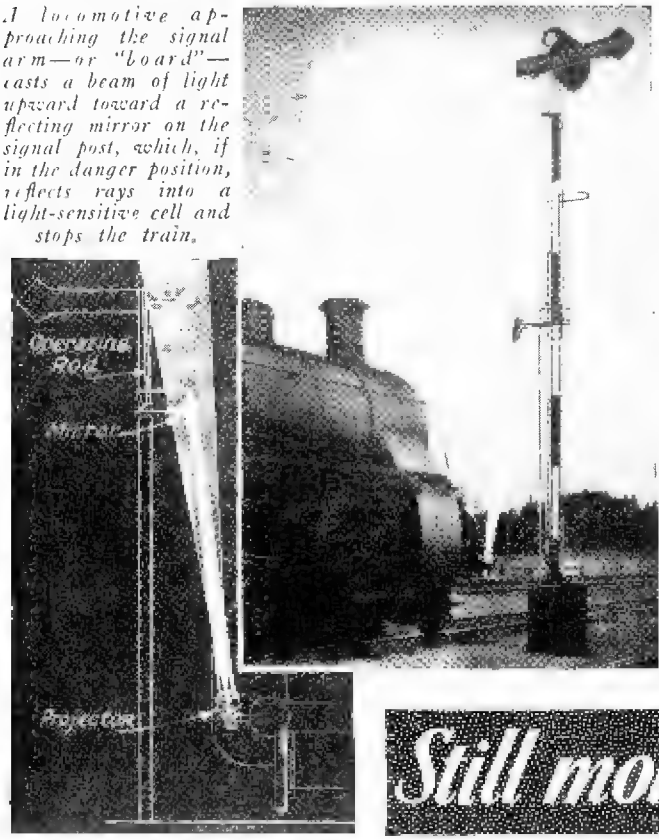


Glider tail may be in front. Greater jump attained with ski-plane shown below.

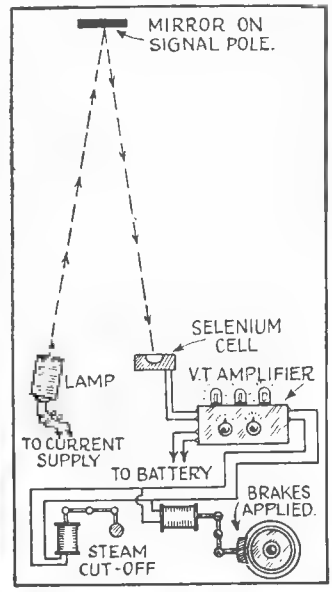


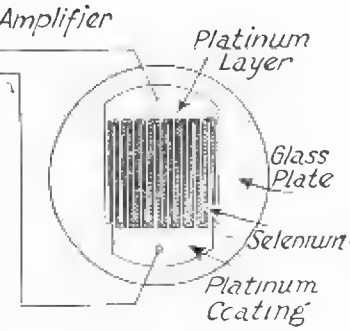


A locomotive approaching the signal arm—or "board"—casts a beam of light upward toward a reflecting mirror on the signal post, which, if in the danger position, reflects rays into a light-sensitive cell and stops the train.



Detailed construction of the selenium cell is shown at right.





Beam of light from projector on locomotive is reflected by a mirror into a selenium cell which, changing its electrical resistance (the effect amplified by vacuum tube), causes relays to put on the brakes.

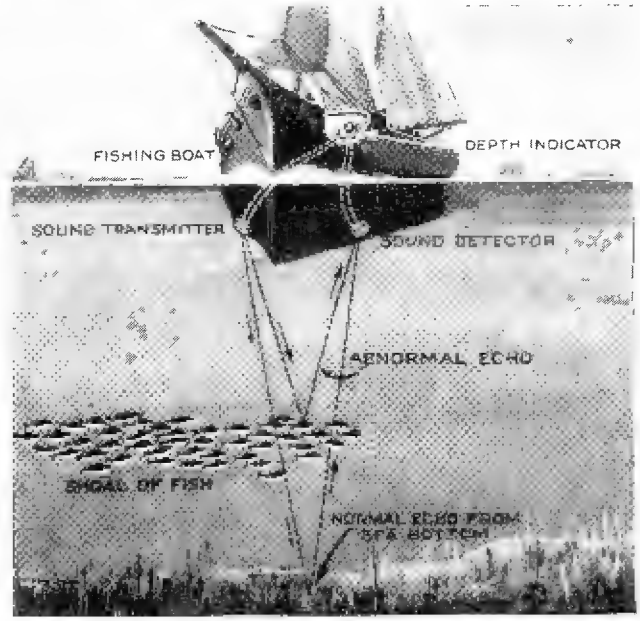
Light Beam Stops Train in Danger

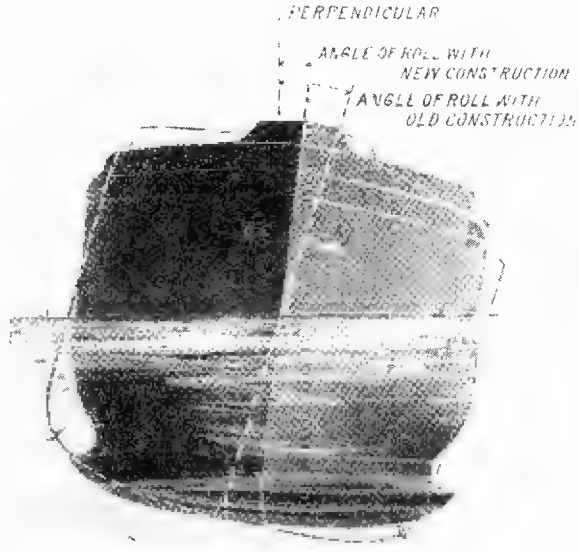
Still more uses for Sound and Light

Fish Located by Echo

DEEP-SEA fishermen can take advantage of new scientific discoveries to revolutionize the old-fashioned fishing industry, which is sadly lacking in modern, efficient progress.

The utilization of some sound-echo depth finders is one modern method that can be successfully applied by them. This apparatus can be used to locate shoals of fish at a depth ordinarily invisible to the human eye. The vessel takes continuous soundings as she proceeds on her quest for the hidden, hoped-for trove, taking into consideration slight variations in the readings obtained by the depth-finder due to normal unevenness of the ocean-bed's surface. When directly over a hidden shoal of fish, an abnormally shallow depth-reading will suddenly result. This is due to the sound waves sent out by the transmitting unit of the depth finder being reflected from the fish, which now act as a new reflecting surface. Nets can then be lowered with undoubtedly good results. This method can be successfully used at night or in fog.





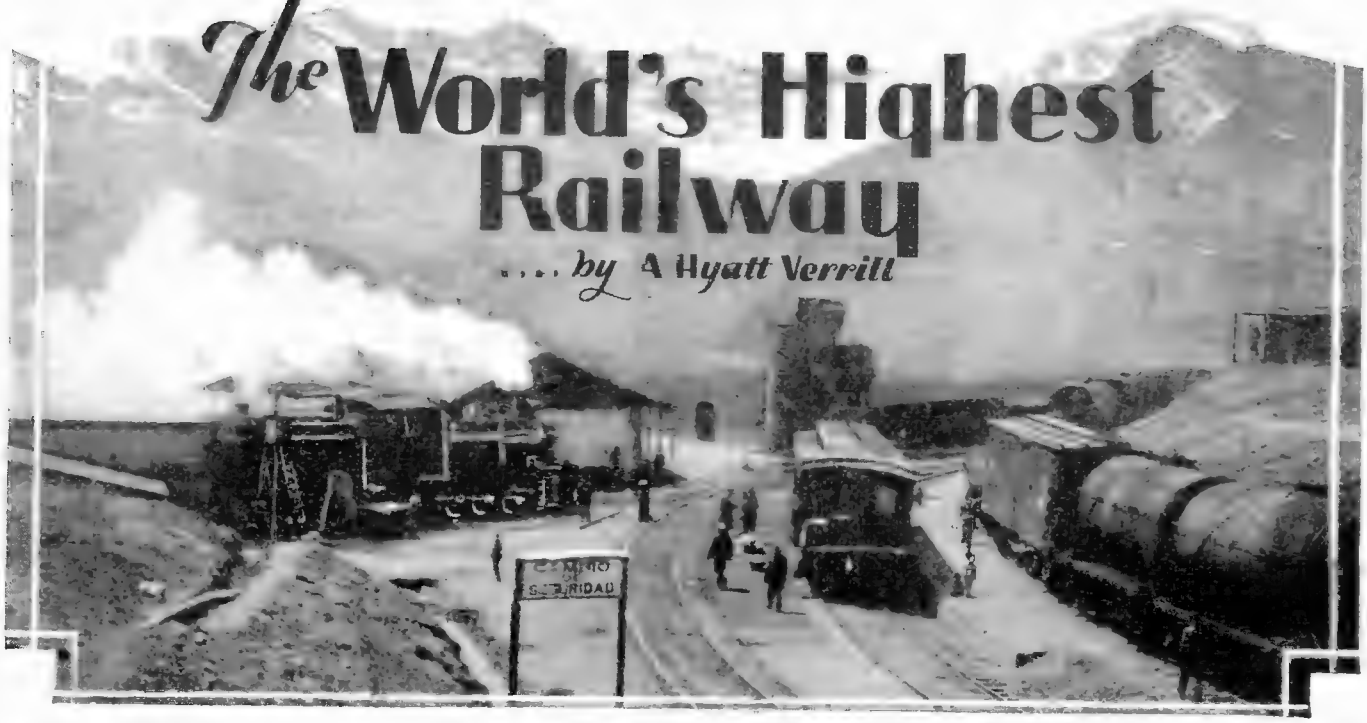
Why Let Ships Roll?

New Style Ship's Hull Promises Relief for Bad Sailors

A NOVEL method of constructing the hulls of ships should be of especial interest to seafaring souls addicted to the unpleasantries of "mal-de-mer." According to Mr. Johan E. Johannessen, the inventor of this new constructive design, ships so built will have decidedly less "roll" than the standard designed vessel. His design calls for a furrow and a special shoulder running longtudinally along the lower portion of the hull. Mr. Johannessen's idea is that the displacement of the water in the furrow, together with the resistance of the shoulder plane, will act to largely prevent excessive rolling.

The World's Highest Railway

.... by A Hyatt Verrill



Peru boasts the highest railway station in the world—almost 17,000 ft. above sea level. This is Ticlio, shown above, the junction point between Lima and Huancayo on the Peruvian Railway.

Passing through a land of scenic beauty, mineral wealth, and majestic mountains, the Peruvian Railway crosses the Viscas Bridge, shown above, located at an elevation of 15,500 ft. Water at this altitude boils at about 184° F., and the number of thermal units is lowered proportionally. It is usually necessary to have special combustion chambers to offset this lowered efficiency.

Anchi Bridge, shown below, in contrast to the rest of the engineering wonders along this railway, is remarkable only in the fact that it is able to withstand the rigors of torrential storms, landslides, new glacial formations, and the frigid cold of a below-zero temperature.

As the safest mountain railway in the world the Peruvian Railway uses no curves or horseshoe turns. Visco Switchback, shown above, pictures the construction needed to obtain altitude.

Chaupichaca Bridge, shown at left, pictures the difficulties encountered in the construction of the Peruvian Railway. This bridge, which leads into a tunnel, overlooks a narrow strip of rocky river bed from which all construction had to take place.

Infiernillo (little Hell) Bridge is well named. The cost of this bridge—a dozen or more attempts were made before it was successfully erected—was greater than that of all the other bridges.

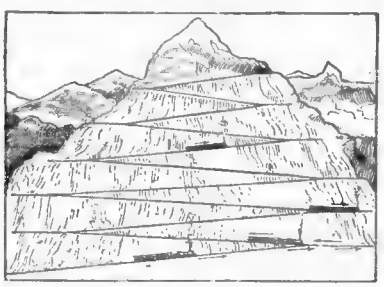


Diagram shows the switchbacking arrangement to obtain altitude of 17,000 ft. above sea level. American locomotives are the standard equipment used for hauling the loads up the steep inclines.

What Is an Ant Skyscraper?
What Is an Aye-Aye?
What Is a Mud Sled?
What Is Rope Tobacco?

Aye-Aye, Sir!

THIS extraordinary looking animal is a new arrival at the London Zoo. It was captured in Madagascar and is called an Aye-Aye. The Aye-Aye is really a member of the Lemur family, and is distinguished by its extremely long tail and unusually well developed middle finger on each hand. These fingers are used to scoop out the centers of nuts and eggs after the shells have been broken. The animal is quite shy and is absolutely nocturnal in habit.

Tobacco by the Ball!

CORD and rope is not the only thing that comes in balls. As a matter of fact, even tobacco is rolled up to greatly resemble a ball of cord. These strange looking balls of rope tobacco are manipulated daily by row upon row of clever Belfast women. The photo above shows only two women of one of these rows. The tobacco eventually is marketed as plug tobacco and is chewed by those who find this form of tobacco even more invigorating than the pipe, cigar or cigarette. It is obvious that one should not jump to the conclusion that the girls holding the strange looking balls in their hands must be manipulating rope.

A Lone Sentry

A GNARLED and storm-twisted tree that has demonstrated its sturdiness stands on a solitary rock as a stalwart sentinel in Friday Harbor. Friday Harbor is located at the San Juan Islands in Washington. The rock itself has been pounded by the elements until it appears ready to topple over. It is just beyond the reach of the ocean waves, and while the winds and weather conditions have torn many a limb from the tree it still clings to its base.

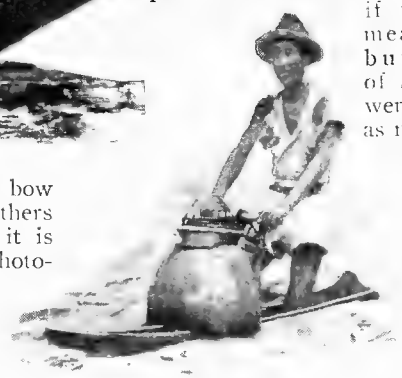
The ant hill at the left holds a million times more inhabitants than the largest human habitation known.

An Ant-Made Skyscraper

TO the left we have a photograph of an ant hill made by the Termite ant. This rises 20 feet above the ground. The photograph shows the structure when compared with man-made sky-scrapers if the ant, measuring but 3/16 of an inch, were as tall as man.

When Ships Roll Over

MANY ships go down bow first, or stern first; others roll over on their sides, but it is rare that one gets an actual photograph of such a vessel sinking. Here is one of the most remarkable shots ever obtained in photographic annals. It shows the Norwegian vessel, Haakon VII, sinking off the coast of Norway after hitting the rocks. Fifty-seven were rescued. No whirlpool was produced when the vessel sank.

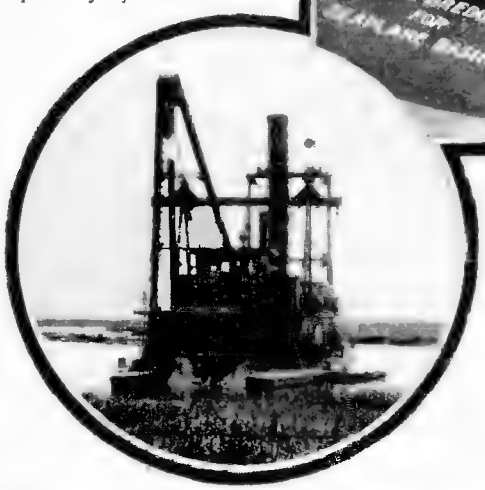


Crabbing With Mud Sleighs

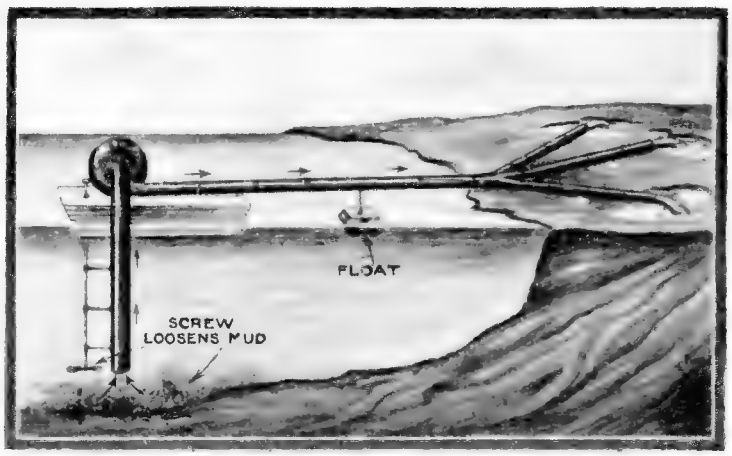
WHEN the tide runs out at Ningpo, China, the crab fisherman on the coast runs out with his sleigh and catches the crustaceans. The mud is so deep that foot travel is impossible.

Five Million Cubic Yards of Mud—1000 Acres of Land—450 Acres Field Space—Compose Secaucus, N. J. Airport.

Below is shown one of the two huge dredges having a pipe line 20 inches in diameter and a half a mile long. This dredge pumps 25,000 to 30,000 cubic yards of mud per day of 24 hours.



MAKING AIRPORTS



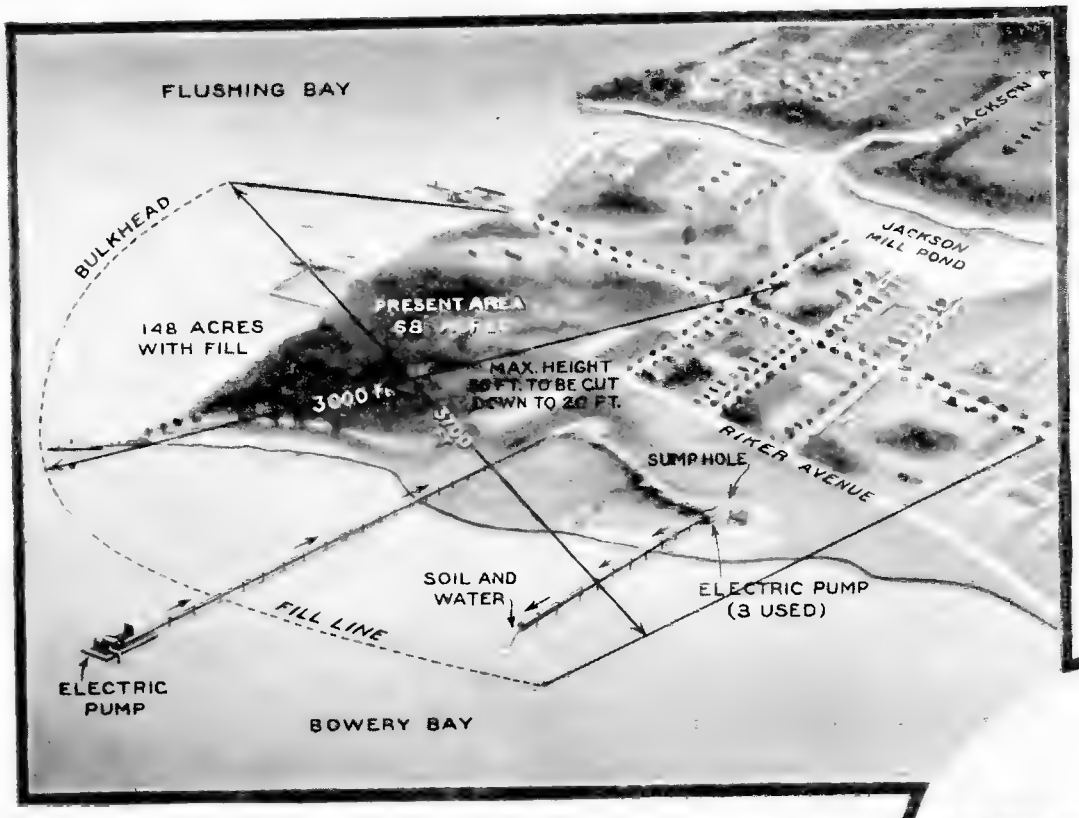
Above—The method of loosening the mud from the bed of the bay, and the means of carrying the silt to the land by centrifugal pumps. A screw loosens the mud and a centrifugal pump mounted on a float sucks this semi-liquid material through the suction pipe and delivers it to the distributing pipe lines.

By H. Winfield Secor.

TWO great engineering projects are now being undertaken by the New York Air Terminals, Inc., which, when completed, will place New York City among the leaders in airport facilities. Think of mud, ordinary mud, to which we only attach the significance of discomfort, being used to reclaim marsh land on which these airports will be located! Imagine a wall of silt, one square yard in cross-section, stretching from New York to Los Angeles, and then you will have some idea of the enormous mass of material used in making one field of a thousand acres and using quantities of mud sucked from a river bed, and one of 148 acres by the same process and also by hydraulic grading and filling. The "wall" is shown below.

These two airports are planned on a huge scale. Their facilities will include a permanent show-room for airplane builders and dealers, display space, service space and storage room for accessory manufacturing firms. One of the fields provides for complete hotel facilities, railroad connections, and automobile highway facilities, which make it the logical airport for the congested City of New York. In other words, these airports are planned to be huge centers of aviation, where everyone from the manufacturer to the passenger may be taken care of.

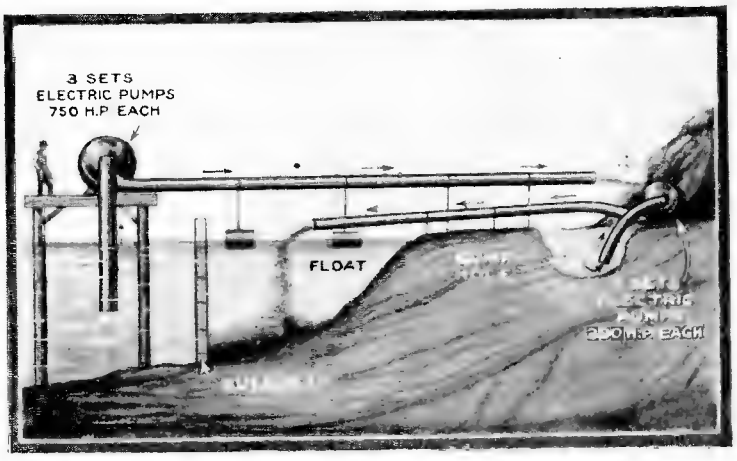
North Beach, N.Y.—Streams of Water Cut Elevation of Hill in Half and Mud is Pumped into Bay to Provide 148 Acres of Landing Space for Planes.



Below is shown one of the pipe lines which distribute the mud and silt to the marsh land used on the site of both airports.

from MUD!

The Secaucus Airport is located in New Jersey, just three and a half miles in a straight line from the center of New York City. Previous to this project it was nothing but a huge field of marshland, utterly useless, and without apparent value. A thousand acres of this huge plot has been reclaimed by dredging the Hackensack River and pumping a stream of mud through a 20-inch pipe for a distance of half a mile and more to the field. The entire reclaiming process requires 5,000,000 cubic yards of mud. Already more than 2,500,000 cubic yards of mud have been dredged and pumped into the field over a foundation of broken rock. The layer of mud found on the river bottom consists of 12 feet of soft mud, 14 feet of tough blue clay, and the balance in red to yellow clay. This combination has been found to settle very quickly and dry very rapidly on the surface. Huge dredges and centrifugal pumps of enormous size, distributing 25,000 to 30,000 cubic yards of liquid material every day for 24 hours, are rapidly completing the Secaucus Airport. When finished, it will open to the aviation industry one of the world's greatest markets, and will offer to passenger transportation facilities which heretofore have been impossible.



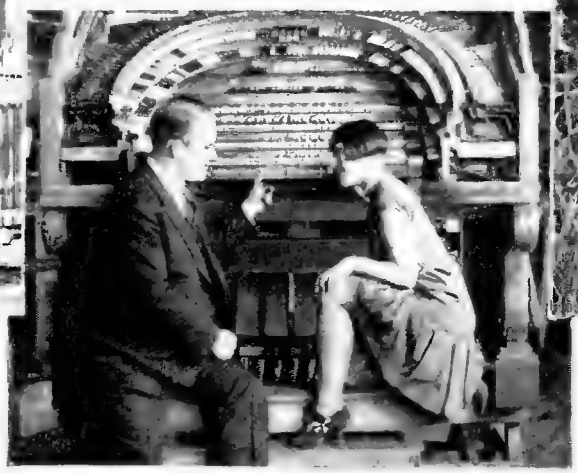
At North Beach, N. Y., the 55-foot hill was sprayed with a concentrated stream of water, which washed the earth into a sump hole, from which it was sucked and piped into the bay behind a bulkhead, to extend the airport area.

The North Beach Airport on the shore of Long Island is a seaplane base for the coastwise aviation service, which has grown to huge proportions in the cities along the Atlantic seaboard. This seaport, shown on left, represents a finer piece of (*Continued on page* 958)

Mighty Console Organ Musical Marvel of Age

This great five-manual keyboard makes it possible for the organist to produce more than a million different combinations. The famous organist, Henry Murtagh, is explaining its operation to Miss Leona Lee.

From this photo can be obtained a conception of the huge size of some of the pipes of this organ. The more tremendous effects are built upon these giant 16-foot diapason pipes.



One of the combination boards permitting original series of tonal combinations to be set up, later controlled from the keyboard by pressing any one of 40 combination pistons.

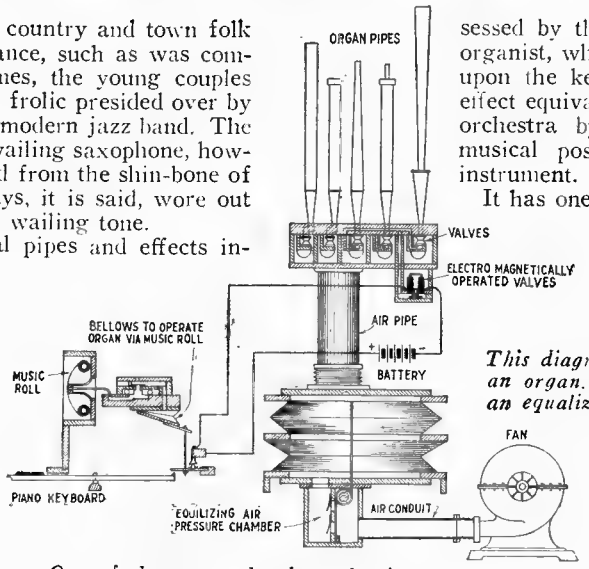
ONE MAN *Plays* 800 INSTRUMENTS *at Once*

IN the classic Roman days, when the country and town folk wanted to enjoy themselves at a dance, such as was commonly popular in those ancient times, the young couples would depart forthwith to the scene of a frolic presided over by a musical organization equivalent to our modern jazz band. The "hot" music, instead of coming from a wailing saxophone, however, emanated from a *tibia plana*, carved from the shin-bone of a wild ass. And the folk of Roman days, it is said, wore out their sandals to the rhythm of its weird, wailing tone.

The *tibia plana* is one of the unusual pipes and effects installed among the resources of the giant console organ found in the Brooklyn-Paramount Theatre. The new pipe was first tried out with only moderate success in the organ of the Uptown Theatre in Chicago and later in Detroit at the "Michigan." It was perfected, however, and provides an important effect in symphonic numbers of Oriental mood, as well as certain types of jazz that are playable on the pipe organ. This is but one of a number of novel features, however, possessed by this organ, which enables one organist, when he gets his hands and feet upon the keys and pedals, to obtain an effect equivalent to a 200-piece symphony orchestra by making the most of the musical possibilities of this marvelous instrument.

It has one of the very few five-manual consoles in the world, provided with five double-

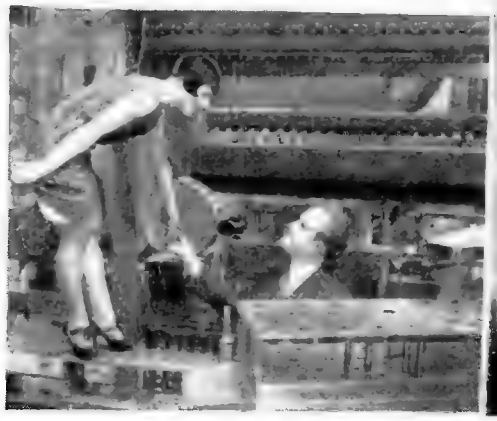
(*Continued on page* 959)



This diagram illustrates the operation of an organ. The fan causes air to enter an equalizing chamber and air reservoir with a storage capacity sufficient to operate many pipes at one time. Keys or perforations in music rolls close circuits through magnetically operated valves controlling individual pipes or effects.

One of the organ chambers showing a "forest of musical pipes." Needless to say, one cannot remain long in such a room if the pipes are in operation.

This chamber shows quite well the intricacies of operation of the various drums, autohorns, cymbals, and other noise makers and effects.



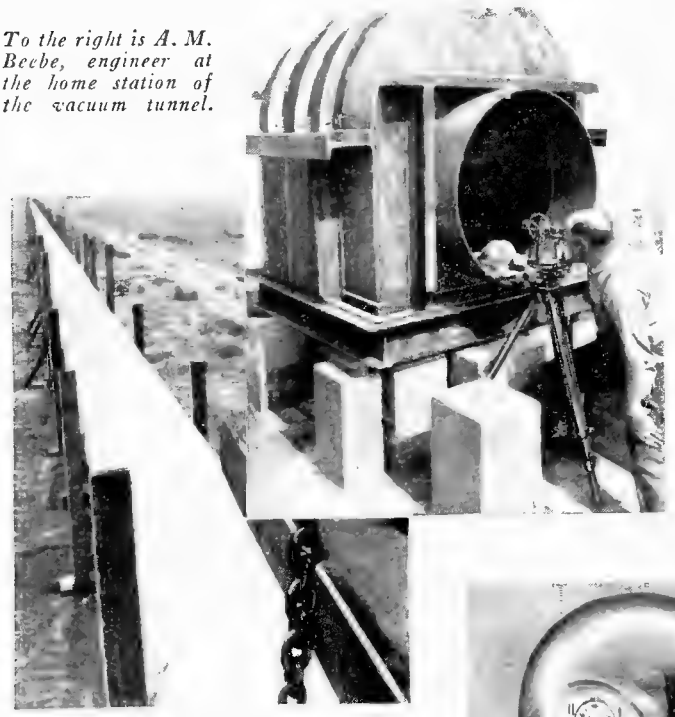
The rear of the organ, showing the thousands of tiny electric wires which are necessary for the control of this great music machine.

New Ways To Measure TIME—LIGHT—STARS

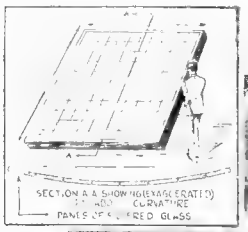
How Velocity of Light is Measured

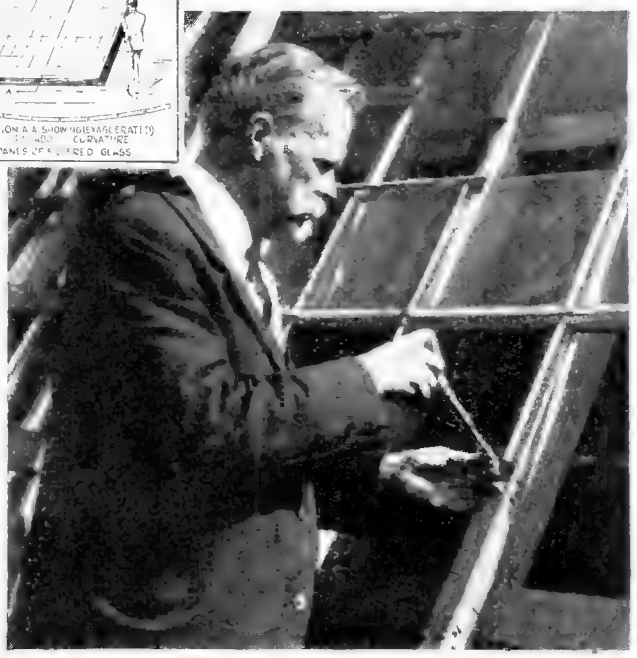
DR. ALBERT MICHELSON, winner of the Nobel Prize, and a group of scientists from Mount Wilson Observatory, are now preparing an experiment by which they hope to calculate the fractional measurement of the velocity of light. The picture below shows the vacuum tunnel which is to be used in this series of experiments. It is seven miles long, three feet in diameter, made of corrugated iron with soldered joints and will be exhausted of air to an approximate vacuum. Dr. Michelson hopes to determine the distance of some of the heavenly bodies from this experiment as well as to check back on his previous determinations of the velocity of light. The experiment is to take place at the Irvine Ranch near Santa Ana, California. This series of experiments by some of America's foremost physicists should clarify many of the problems of astronomy and physics which depend on the exactness of the velocity of light for their solution.

To the right is A. M. Beebe, engineer at the home station of the vacuum tunnel.



Builds Backyard Telescope





C. W. WOODWORTH, Professor of Entomology at the University of California, is now building in his backyard what reports claim will be the world's largest telescope. He is attempting to make a giant composite reflecting mirror for the examination and photographing of the heavens. By the end of another year he expects to complete the immense telescope with its mirror of 100 square feet of reflecting surface, and with its aid view the North Star with more clarity than the average amateur telescope affords. He has built a wooden rack on which he is mounting 400 separate glass plates, each of which he is grinding himself. Such is the report from California, but we are inclined to question Professor Woodworth's success in making such a mirror, for the wooden frame which he is using will be subject to atmospheric changes and bending stresses, and will not remain accurate.

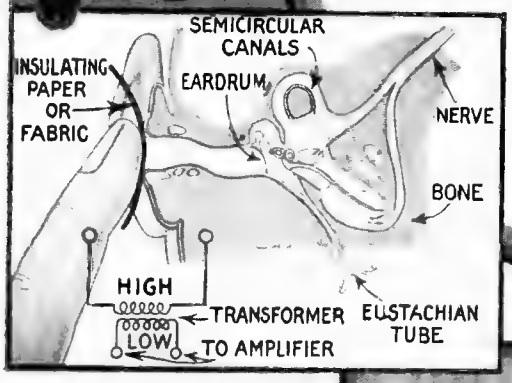
Dry Battery Clock Keeps Accurate Time

THE clock shown at right is the only electric time-piece manufactured which depends on a dry cell for its operation. It is entirely springless, and utilizes the well-known electrical principle of intermittent current pulses. The dry battery supplies current to a magnet, which in turn causes an armature to move, giving the pendulum a momentary push of considerable strength. The pendulum is very delicately balanced, and as a result swings for a considerable length of time. When it is almost completely run out, it comes in contact with a slotted projection, which closes the battery circuit and another electrical impulse causes the armature to move again and push the pendulum. This process keeps on until the battery is exhausted, and the unusual feature in this case is the fact that the battery lasts for a year or longer. This clock was used in the office of one of the editors of this magazine and was found to keep very accurate time, once the pendulum had been properly adjusted.

A few of the wonders which have recently been developed in the telephone laboratories are shown on this page. At left is seen the huge loud speaker which reproduces the sound of crunching teeth. The enormous amplification used makes this sound seem like a crash of thunder.

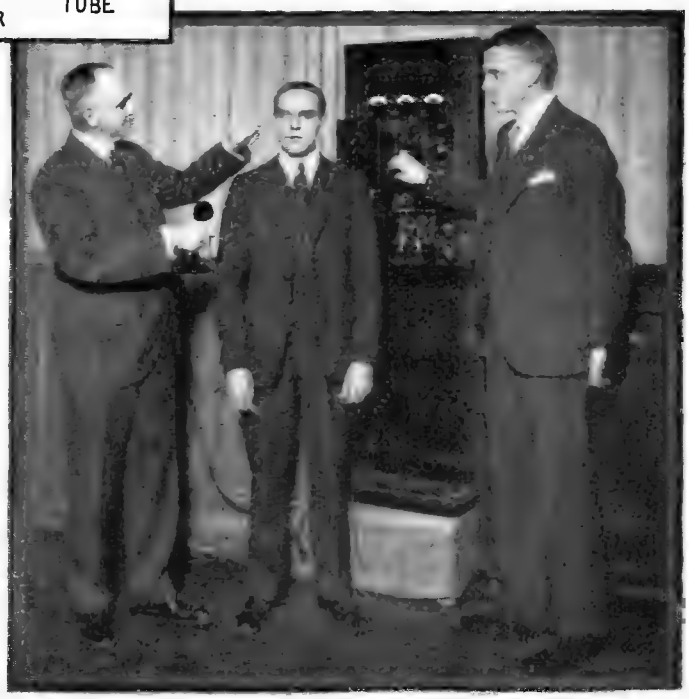
NEW TELEPHONE MAGIC

How the Dial Telephone actually "Talks" to Central! Transmitting the voice from finger tips to the ear; Delaying speech over a circuit, and other paradoxes.



Above is a sectional diagram of the ear with a piece of paper placed over the opening. The high frequency charges issuing from the finger cause the eardrum to react to the discharge—resulting in sound impressions on the auditory nerve.

Mr. Grace is shown above with the "delayed speech" apparatus. The audience hears the sound as the operator speaks into the microphone. A minute later they hear the speech coming from the loud speaker located at the other end of the spiral string arrangement.



At left is shown the actual demonstration of the condenser discharge effect on the eardrum. Mr. Grace is holding the anode in his right hand. The sounds in the form of electric currents, pass through his body and out through his left hand to the ear of the subject.

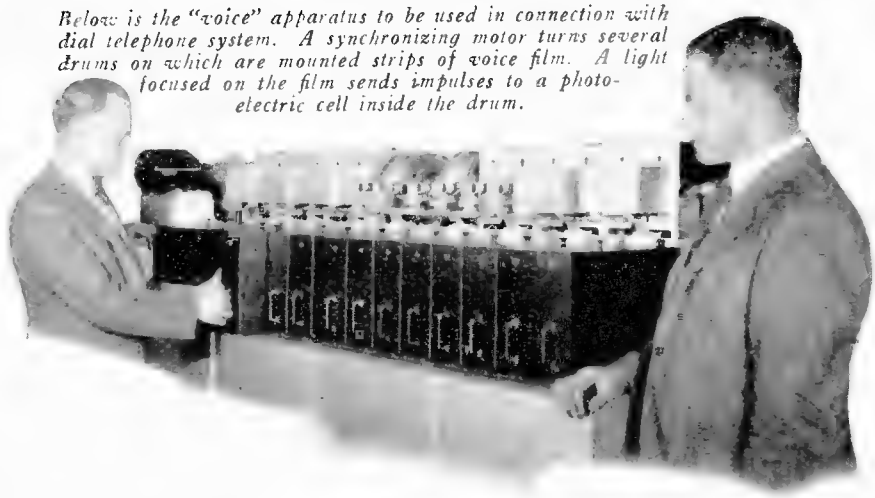
Photos courtesy of Bell Telephone Laboratories

MANY new inventions of the telephone laboratory were recently shown and demonstrated at a meeting of the American Institute of Electrical Engineers in the auditorium of the Engineering Societies Building in New York City, by Sergius P. Grace, Assistant Vice-President of the Bell Telephone Laboratories.

The many tricks and twists performed by the machines utilizing modern ideas in sound and light propagation completely mystified the rather skeptical audience. A machine using sound film, which will replace costly apparatus in the modern telephone office, a huge loud speaker which amplified the crunch of human teeth to a thunderous roar, the transference of sound from the finger-tips of one person to the ear of another, a telephone network which delayed the speech

transmission from microphone to loud speaker for the period of one second—these were some of the startling demonstrations which occurred at this highly interesting meeting.

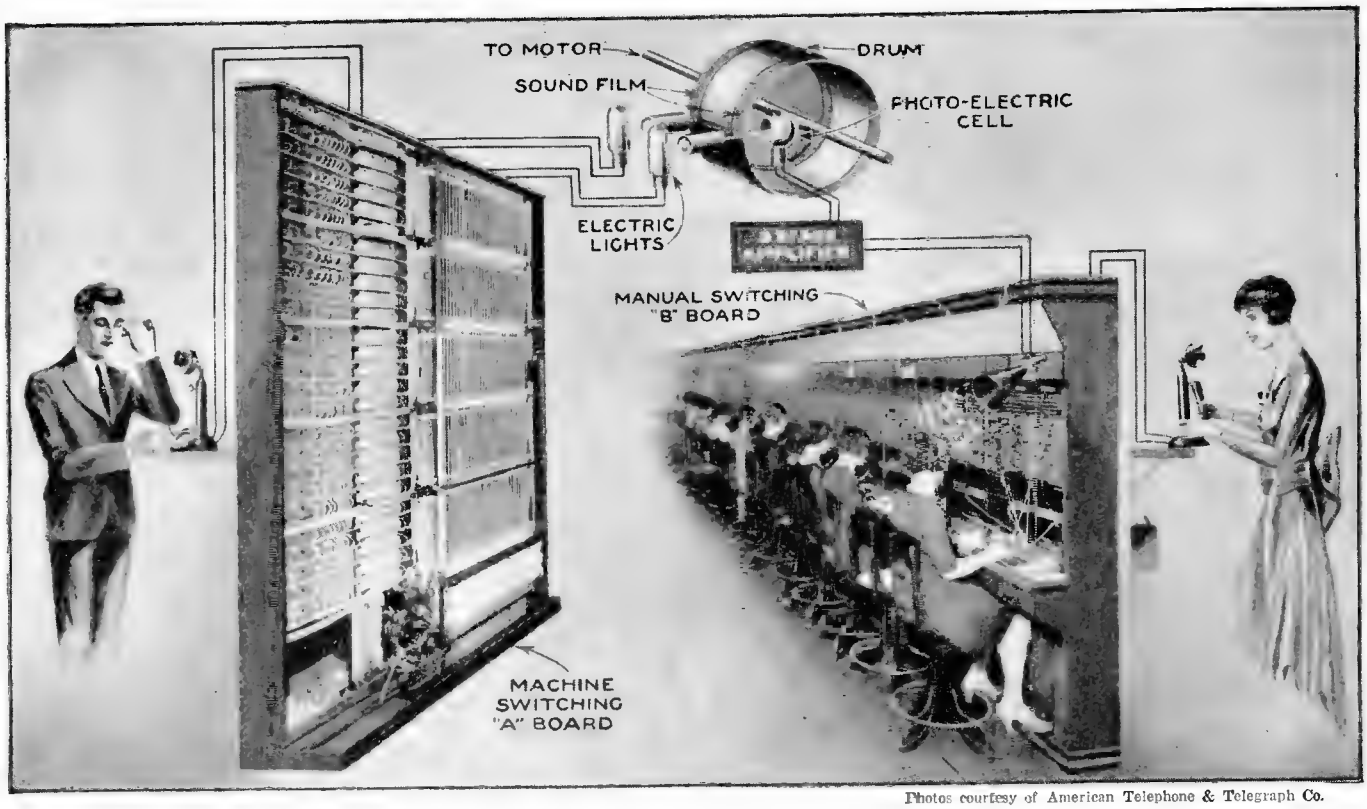
The explanations of some of these achievements are rather complicated; some of them are simpler. Consider the transmitting of sound waves from the finger-tips of one person to the ear of the other. In the performance of this experiment the demonstrator held an electrode in his right hand, and pointed the fingers of his left hand toward the head of the receiver subject, as we may call him—about an inch away from the ear, which was covered by a piece of insulating paper. Sound frequencies were received from a phonograph record, passed through amplifiers and transformers so that they reached the body of the demonstrator in the form of electro-static impulses, super-audible in their frequencies. The electro-static charges collected on the finger-tips of the demonstrator resulting in an enormous difference of potential between the ear-drum and the finger-tips. A condenser effect was produced, and the discharge from the finger-tips caused the ear drum to vibrate; this resulted in the sound impression on the auditory nerve. This explanation is of course more theoretical than actual, for as the ear is a delicate and sensitive organ, inaccessible for experimentation purposes, it is naturally very difficult to ascertain the exact procedure which takes place.



Below is the "voice" apparatus to be used in connection with dial telephone system. A synchronizing motor turns several drums on which are mounted strips of voice film. A light focused on the film sends impulses to a photo-electric cell inside the drum.

After concluding this demonstration, Mr. Grace walked over to a huge loud speaker which was placed on the opposite end of the platform. He turned around, faced the audience, and then brought his teeth sharply together. An answering roar came from the speaker which nearly lifted the spectators out of their seats. This appeared spectacular; it was accomplished by using several stages of amplification, which stepped up the noise. Then Mr. Grace spoke through the microphone attached to a long helical spring strung across the platform. He was heard to speak into the microphone, and then after a noticeable pause, the voice issued from the loud speaker. A very complicated circuit was required to delay the speech for a length of time appreciable to the human ear. The details are too technical for anything less than a full discussion. It is sufficient to say that by means of the helical spring, couplings were secured which controlled the movement of sound in every direction, and consequently caused the delay in transmission.

An instrument which interested the audience was that named the "Call Announcer." One of Mr. Grace's assistants stood at a panel of buttons and as he pressed some of them we heard a series of spoken numbers issuing from the loud speaker. We were told that this machine would replace a large amount of costly apparatus in the modern telephone exchange. All that could be seen was the neatly painted instrument and the panel of (*Continued on page 937*)



Photos courtesy of American Telephone & Telegraph Co.

The dial-to-"voice" apparatus in action as depicted by our artist. The electrical impulses from the dial travel to machine switching "A" board; from there they are carried to the call announcer, to the operator of the manual "B" board, who completes the connection with the party at the other end.

The above picture does not show the actual telephonic connections—merely the hook-up in connection with the "voice" machine. The drum, synchronized by a special motor, contains two strips of sound-record film. Each strip of film bears a separate "vocally recorded" number, from one to ten.

When the Fates Fooled

CHING LING FOO

And His Imitator—

CHUNG LING SOO

By Dunninger

Photo in upper right-hand corner shows the famous magician, Harry Kellar, shaking hands with Ching Ling Foo, the Chinese wonder-worker. The larger scene shows an amusing moment when Ching Ling Foo's assistant inadvertently allowed one of the fish bowls, concealed beneath his clothes, to leak water, which convulsed the audience. The picture in the circle shows the dramatic moment when Chung Ling Soo, Foo's imitator, caught a real, instead of a false bullet in his teeth through an error.

The Bullet-Catching Trick That Failed; the Mysterious Fish Bowls; What Happened When Ching Ling Foo Challenged Chung Ling Soo

ALADDIN rubbed the wonderful lamp he discovered and every wish he made was fulfilled. Magicians and mentalists have discovered no lamp with these magical qualities, although many of us have, since the first disciple of the Magi made his appearance, sought in vain for an article of that type.

I know that if one delves back into the history of the lives of magic men, one is sure to find, not a collection of stories unfolding the sensational rise to success, fame and prosperity of magicians, but a sordid tale of trials and tribulations, heartaches and a persistent battle for supremacy.

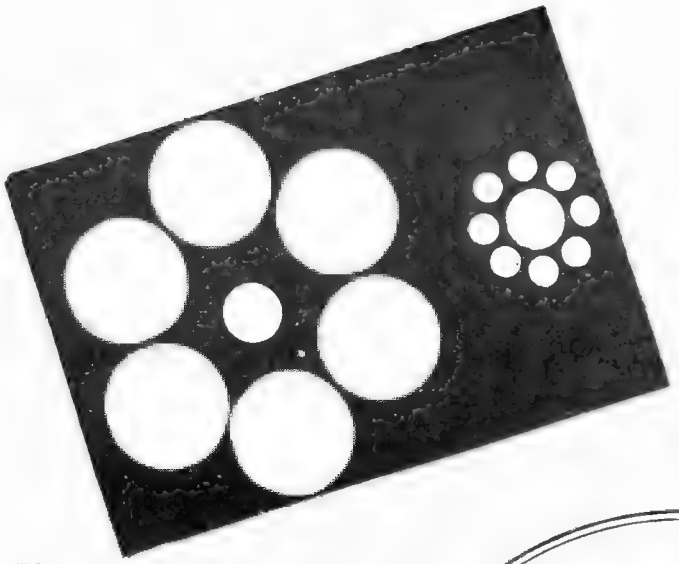
Kellar, Devant, Ching Ling Foo, Houdini, De Bierre and many others, including the great Herrmann, fought for their places in the hall of magical fame, step by step, battling obstacles that never find their way into the paths of leaders in other vocations.

Take, for instance, the Chinese wonder-worker, *Ching Ling Foo*. For years this master among Chinese magicians appeared only in his own country and various parts of Europe. His share of the troubles and trials besetting the magic man were indeed many. But he gritted his teeth and in true Chinese fashion battled onward.

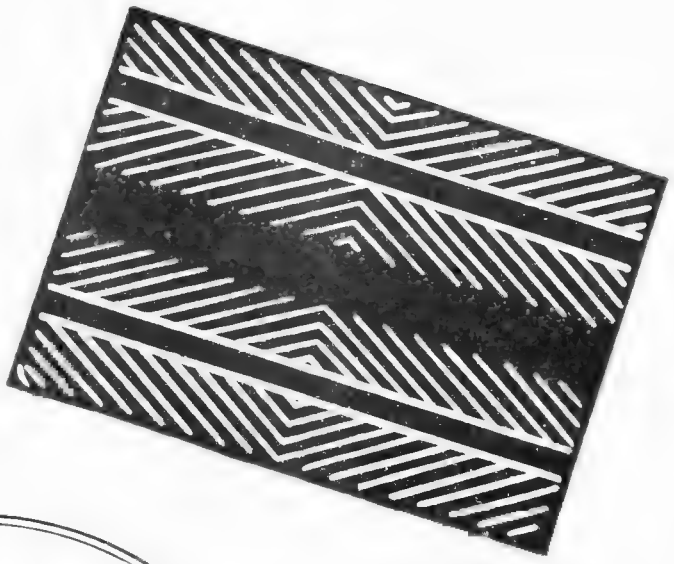
A. Frank Jones, who for years was the general booking manager for the Percy Williams circuit of theatres and for a long period associated with the world-famous Hammerstein's Victoria, brought Ching Ling Foo to America.

Mr. Jones was sent to Europe many times a season by the late impresario, Oscar Hammerstein, to seek out novelty acts that would, with the proper advertising and publicity campaigns, become sensations in this country. Foo and his troupe of orientals left their (*Continued on page* 962)

Ching Ling Foo was fooled by Harry Kellar's "talking skull," and threw it down.

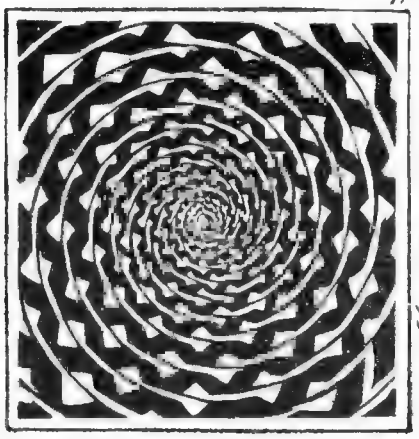


The two inner circles shown above are the same size! The effect of the one at the right, being larger, is obtained by placing the smaller circles about it.

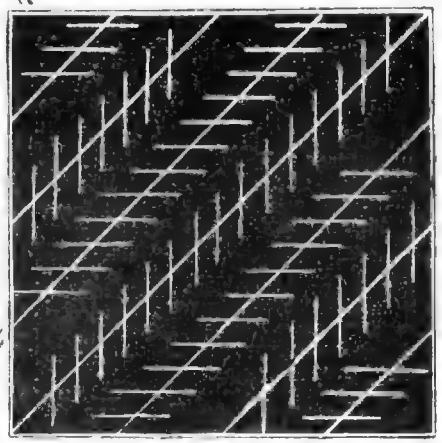


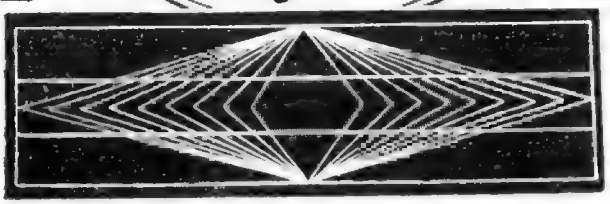
Are the center lines parallel in the above figure? They appear not to be so, but turn the page so that your eye looks across the page, and you will see that they are parallel.

Do You See Straight?



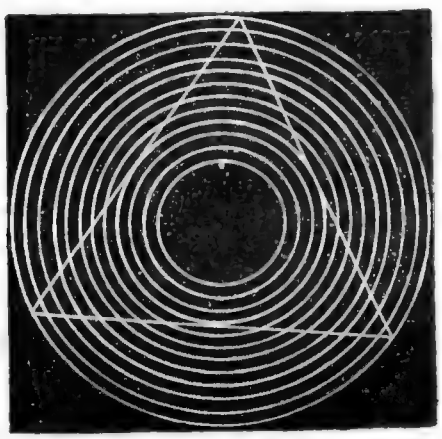
ABOVE is one of the latest optical illusions, due to a shortcoming in our sight. If you look at the drawing casually, you will think that the figure is a spiral, but on careful examination and measurement you will see that in reality the figure is made up of a group of concentric circles. These circles, however, are arranged in such a way that the first impression on the optic nerve is that of a spiral figure, and thus we fool ourselves with our own eyes.





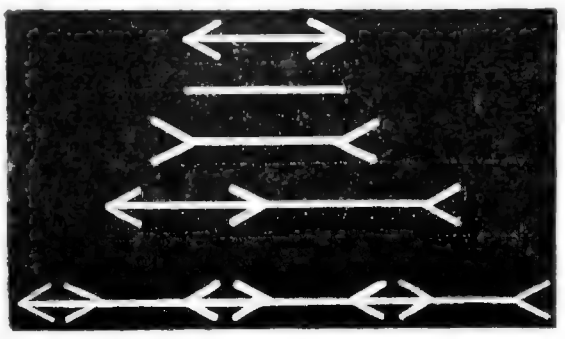
ABOVE is another example of the way our eyes may fool us. The lines running lengthwise, in reality, are parallel. The triangle in the center and the diagonal lines which are parallel to the sides of the triangle make the two parallel lines appear to converge at the center. If one turns the page, so that the eye looks across the page, he will see that, sure enough, the lines are parallel.

NOW don't say that we lie, dear readers, when we tell you that all of the diagonal lines shown in the above drawing are parallel. You would say, after a hasty glance, that the diagonals couldn't possibly be parallel. We don't like to cross you in your opinion, readers, but place your eye so as to look along the lines, and you will see that the diagonal lines are parallel to each other.



AT the left the triangle within the group of circles has straight line sides, believe it or not! One would almost wager that this was not so; that the sides of the triangle converge at the center of the circle, but look again! Hold the page so that the eye follows the side of the triangle from base to apex, and you will see, certainly, that your eyes have again fooled you.

THIS is the last one of the eye-teasers. All the lines are equal between the arrows, and as Mr. Ripley would say, "Believe it or not," they are. Take your ruler and prove it to your own satisfaction.



Rocket-Driven Bicycles

THE photograph at the right was taken in Germany, where experiments with rocket-propelled vehicles are being constantly conducted. These experiments are taking on very serious aspects, and no doubt a rocket-propelled plane will soon be winging its way across the vast expanse of the Atlantic Ocean to make a safe landing in America. Remarkable speeds were obtained by mounting eight rockets on bicycles, four on each side, as the photo at the right illustrates.

In the Spotlight

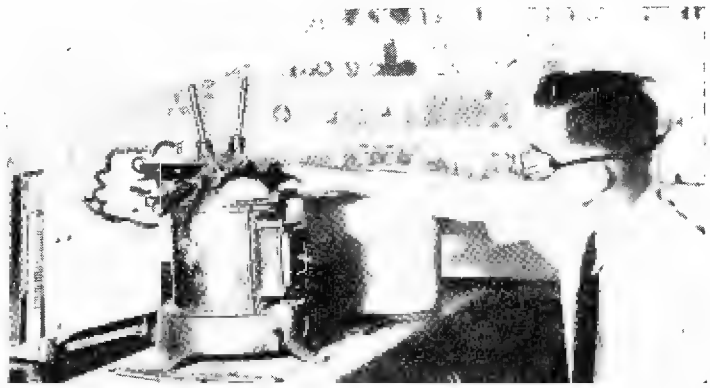
Inventors' New Devices

Electric Chair Reduces Fat

HERE is the latest type of weight-reducing machine which was introduced at the National Beauty Show at Los Angeles, California. The patient in this chair is Miss Mymie Warreff, who is anxious to have her waist reduced. As can be seen by the photograph, a number of sand bags are placed on those portions of the patient's figure from which the weight is to be reduced. The body electrodes are connected with the source of current, which is of a pulsating nature. At the beauty show the young lady in the picture, Miss Florence Cronan, operated the chair and regulated the current as well as the speed of the motor-driven commutator, seen in back of the patient's head.

Diamonds From Sugar!

AT a meeting of the American Chemical Society the scientists were astounded at the assertion of Prof. J. Millard Hershey, of McPherson College, McPherson, Kansas, that large and beautiful diamonds can be made by hand from sugar. Professor Hershey then demonstrated with the machine here illustrated, and produced a small diamond, shown enlarged in the insert. This diamond was about the size of a grain of sand. But sugar can be carbonized and the diamond is carbon.



A Gun-like Telescope

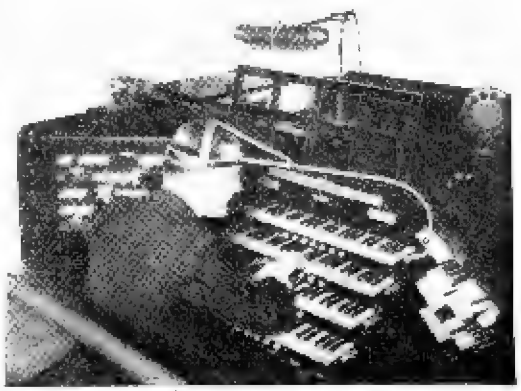
AT first glance this photograph might be taken for a most modern type of Big Bertha, the name of the gun which was noted for its long-range shooting. Actually, the instrument is very peaceable. It is the huge solar telescope of the observatory at Treptow. Note the amateur astronomers awaiting to get a glimpse of the sun.

Sun Has no Heat?

DANVILLE W. STARRETT, of Oakland, California, claims the sun is as cold as Venus. To prove this, he concentrates the rays of light by means of a magnifying glass, passes them through a block of ice, and sets paper on fire. Unfortunately scientists do not agree with him.

The Eleventh Finger

WM HOFFMAN, the organist at the Loew's Theatre in New York City, has invented what he calls an eleventh finger. This consists of a band which fits the organist's head, as seen.



A "Rolling" Motor

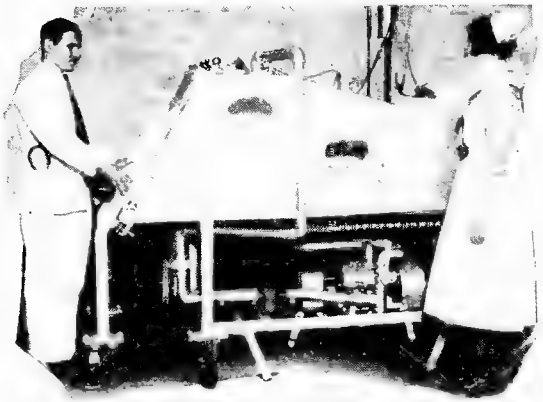
THE Siemens-Schuckert works of Germany have produced a "rolling" electric motor which can be rolled from place to place for temporary jobs.

of Science

Caught by Our Cameramen

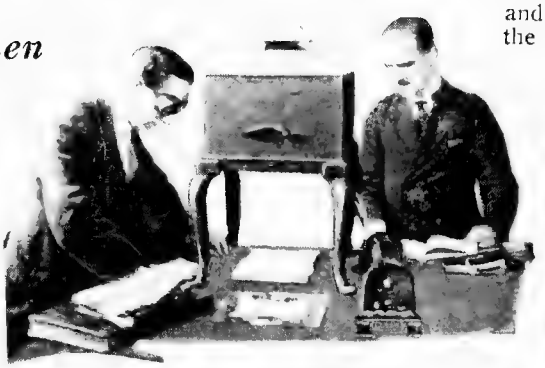
Hands and Feet Paddle Canoe

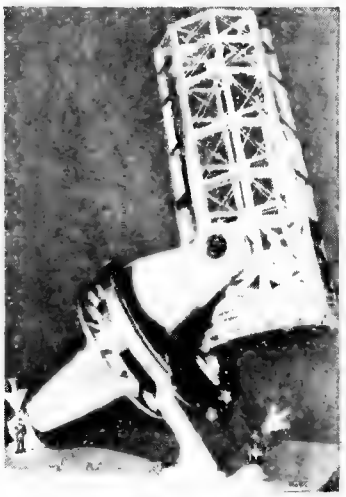
THE new mechanism shown in the photograph at the left has been perfected and will find its way into canoes. The paddles are so mounted that they can be actuated by either the hands or the feet or both. The device weighs only 11 pounds.



New Mechanical Respirator

INSTEAD OF pumping air in and out of the lungs through a tube and mouthpiece, a new mechanical respirator, which has been proven successful, rhythmically increases and decreases the air pressure on the outside of the chest. The patient is enclosed in an air-tight tank of sheet iron.





Carbon-Paperless Typewriter

BETTER known as the "Lady Edison," Miss Beaulah Louise Henry has stepped forward with another invention to her credit. An article on her previous inventions appeared in this publication some time ago. This device consist of an added ribbon, which takes the place of the carbon paper for making copies with a typewriter.

Reading Ancient Manuscripts

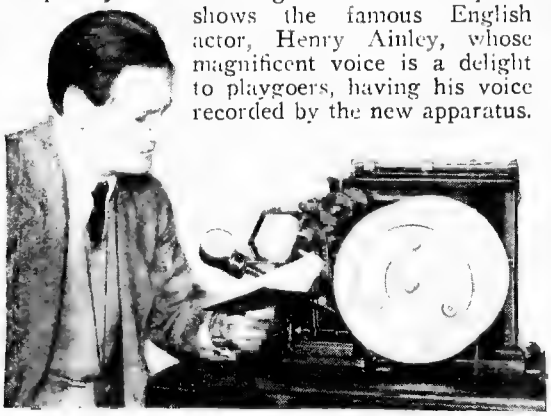
MANUSCRIPTS that are barely legible, particularly those of ancient origin, which have become obscured by age, are now easily read by the aid of the ultra-fluorescence cabinet recently presented by an American to the British Museum in London. The ultra-violet rays have a remarkable effect in rendering the writing legible.

World's Largest Telescope

THE new telescope, with a mirror 200 inches in diameter and weighing 30 tons, and which is estimated to penetrate three times as far into space as any now in existence, is shown here as it will appear when finished.

Records Your Voice on Steel Wire

THE human voice has again been recorded on steel and tape in the new telegraphone developed by a German organization. This photo shows the famous English actor, Henry Ainley, whose magnificent voice is a delight to playgoers, having his voice recorded by the new apparatus.

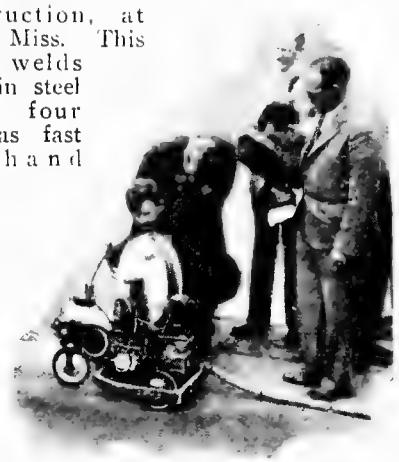


Deaf Hear Talkies

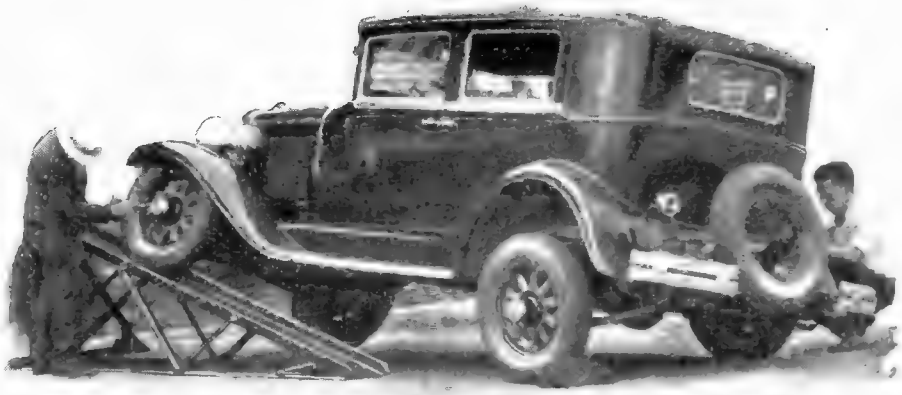
BY fitting the seats of a motion-picture theatre, the Graumans' Chinese Theatre, at Los Angeles, California, with receivers connected directly to the amplifying apparatus for sound films, the volume is so increased that people hard of hearing are able to understand words and music.

Automatic Plate Welder

THE automatic welding engineer here shown was demonstrated at the American Institute of Steel Construction, at Biloxi, Miss. This device welds seams in steel plates four times as fast as a hand welder.



Your Car Gets the THIRD DEGREE



This "one-track hill" shows the degree of distortion of a frame under most unfavorable conditions. The hub of the "Viking" car is shown 38½ inches from the ground.

By M. M. Roberts
of the Olds Motor Works, Lansing, Michigan

INASMUCH as many of our readers own and drive one or more of the 1,842,443 cars sold last year by the General Motors Company, it should be of more than passing interest to know exactly how these cars are given gruelling road and efficiency tests. We therefore asked Mr. M. M. Roberts, associated with the Olds Motor Works, to tell, in this exclusive article, how their newest car, the "Viking," is given the third degree.

After passing this test, there is little danger of a car stalling during a rainstorm. The depth of water can be regulated.

CONSIDER the best brains in the country's greatest industry working day and night over drafting boards and intricate machines, striving and striving, not for personal gain, but to enable the world to drive better automobiles at less cost. That was the outstanding picture carried away after a visit to the General Motors *proving ground* near Milford, Mich., which has been aptly named "the great outdoor laboratory."

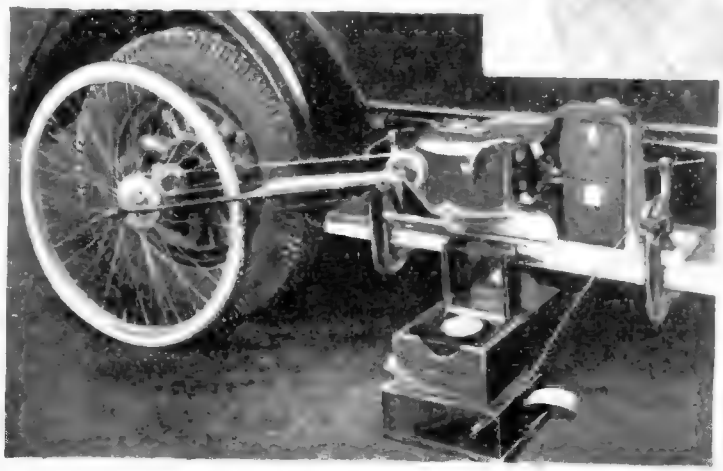
The writer was a guest at the proving ground of Oldsmobile-Viking, two of the nine General Motors passenger cars. One of the new Viking, V-type, eight cylinder automobiles was placed at his disposal so that he could view every portion of every activity included in the 1260 acres of rolling land which comprise the proving ground.

This ground is maintained by General Motors and is operated under the direction of their engineers, assisted by those of the General Motors Research Laboratories. Each automobile division has a garage and workshop, with a corps of engineers at the proving ground, and has available for its use all of the testing equipment of the corporation.

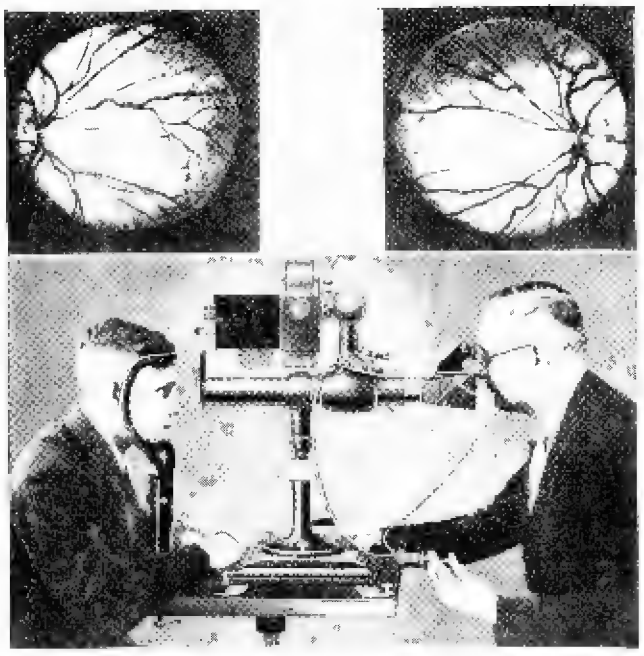
Broadly speaking, the engineers are en-

(*Cont'd on page* 941)

The "flowmeter," shown on the right side of the cowl, indicates the number of miles to a gallon of gas a car will run.



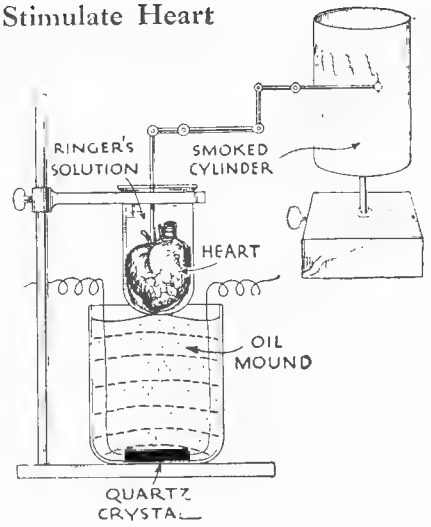
A fifth wheel actuates two revolving discs, enclosed in a case with a moving picture machine which is timed for an exposure every second by a clock. One disk is marked in feet and the other in tenths of a foot. As these disks revolve, the acceleration of the car is photographed by this mechanism—illustrated at left.



Snap-Shots Your Eye in Split-Seconds

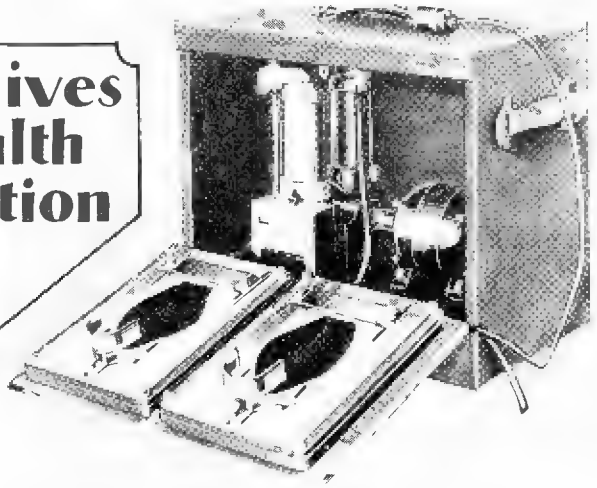
A SPEED camera, the invention of Dr. Nordenson of the Zeiss Company of Germany, was recently used to photograph the action of the human eye with 1/20th of a second exposure. At the top of this page may be seen the right and left eye-balls as they were photographed while the subject was focusing his eyes on a near-by object. It is hoped that with the aid of this apparatus scientists will be able to more clearly tell the reaction of the eye to images and light stimuli.

Super Sounds Stimulate Heart

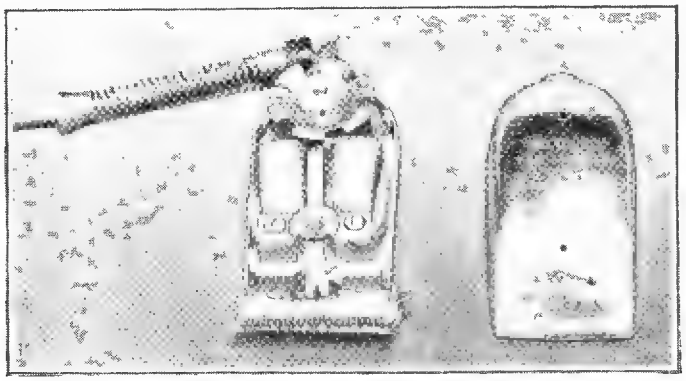


THERE are many ways of stimulating the human heart, both by emotions and drugs, but it remained for Dr. Newton Harvey of Princeton University to show us that the human heart will respond to vibrations at frequencies of 300,000 to 2,500,000 per second. At left is shown diagrammatically the experiment performed by Dr. Harvey to illustrate this. A quartz crystal was placed in an oil bath and connected to a source of electricity. The alternations of the current produced contractions and expansions of the crystal, resulting in the vibrations. The action of the heart, when stimulated in this way, was recorded on the cylinder shown to the right.

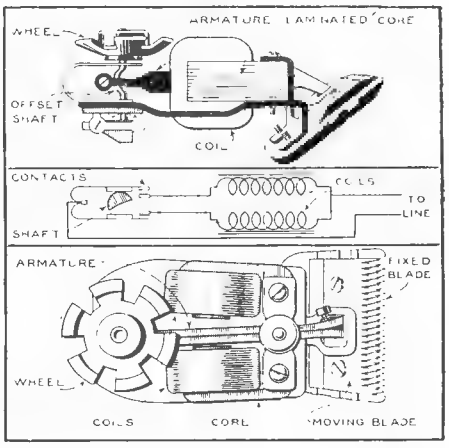
Science Gives Our Health *her* Attention



"An Electric Hair-cut, Sir?"

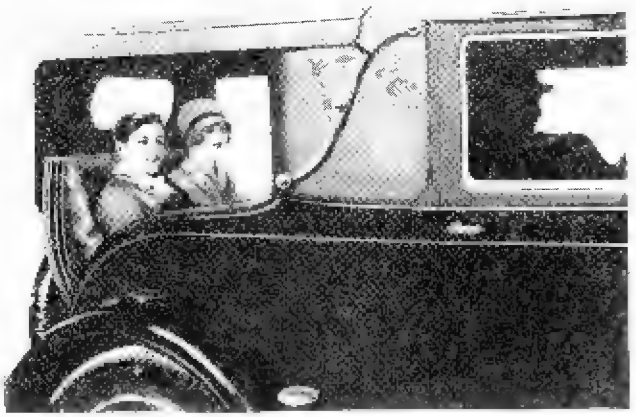


A BRIGHT young inventor recently exercised his ingenuity and perfected this novel hair clipper; it has two magnet coils, an armature, and a commutator which, by means of a wiping contact, creates a magnetic field, first in one coil and then in the other coil. The vibrating blade teeth cut the hair.



This Machine Massages Tired Feet

THIS foot-massager consists of a motor-operated air-pump and rubber foot-pads, under which the air is alternately forced and then withdrawn from beneath them.



Comfort in Rumble Seats at Last!

THE rumble seat has always been a very convenient addition to any car, but when the rain poured it was not so convenient. A manufacturer has solved the problem with a collapsing top for the rumble seat. He claims convenience of adjustment, and complete protection from the elements.

Making the Perfect Cup of Coffee

HOW women can make perfect coffee in the home by any of the three recognized methods is here described. How men can make perfect coffee when camping is also given.

By Mrs. Christine Frederick

MRS. CHRISTINE FREDERICK is the founder and director of the Applecroft Home Experiment Station, Greenlawn, Long Island, and a counsellor to manufacturers on marketing home goods. She is the author of several books, among which we find "The New Housekeeping" and "Selling Mrs. Consumer." She has edited various women's magazines and has lectured on household problems in America and abroad.

The article on this page is the first of a series expounding the advantages of scientific cooking.

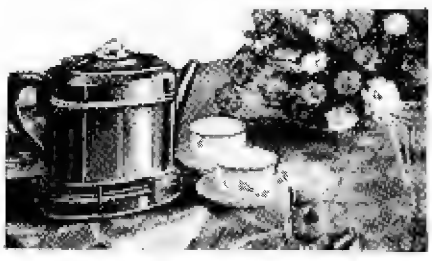
I WAS in Europe last summer, and every American I met there had the same plaint. "Why, oh, why can't one get a good cup of coffee anywhere in Europe?" Never before had they realized how comforting the art of making a good cup of coffee might be. Here and there a hotel proudly boasted in its advertising that you could get a cup of real American coffee, but, alas! the boast was too often without foundation. Not that they didn't *try*; but somehow it doesn't seem given to Europeans to make good coffee.

Returning to America the tourist is sure to have genuine respect and admiration for good coffee making. Too often in America the making of coffee is supposed to be a most commonplace art. On the contrary, it is a most difficult one, well worth the time of man or woman to learn. It is far from a job which any kitchen helper understands. America still drinks vast quantities of bad coffee, for there are millions still benighted enough to make coffee in the same old primitive way of boiling that earned for it long ago, the well-deserved, contemptuous name of "railroad station coffee." There are, as a matter of fact, large numbers of American people so accustomed to poor coffee that they do not know it. The reason is that they violate the first principle of good coffee, which is that it must invariably and always be *freshly made*. It is a terrible crime against good coffee to boil up the old grounds once more.

How then shall the "perfect" cup of coffee be made? In the first place we must bear in mind that there are at least three separate methods of arriving at the "perfect" results. (1) the boil method, (2) the percolator method, (3) the drip method. It does not matter so much which method you use to arrive there, but two things matter a great deal: First the grade and kind of coffee you use; and second the scrupulous cleanliness of the utensils you use; not just ordinary cleanliness, but *special* cleanliness. A neglected spout, or an overlooked bit of coffee scum on a percolator, or a hurriedly washed utensil will make all the difference in the world. You see—contrary to many people's ideas—good coffee is judged almost wholly *by its aroma*. You can't enjoy your coffee very much *without the aid of your nose*. Experiment by holding your nose tightly shut some day and prove it to yourself. You can easily understand, therefore, that an aroma is a delicate and easily spoiled thing, and nothing so readily spoils it as *another aroma* coming from musty uncleanliness or dirt. As is the case also with tea, the best aroma of coffee is that which comes from freshly ground good coffee, contacting only with absolutely clean utensils, and drunk soon after making, before the aroma departs or it is made harsh, acrid and heavy. If you understand that to secure the perfect cup of coffee you must capture and protect this delicate aroma, then you have passed the first hurdle in good coffee making. For this reason brushes should be used in cleaning percolators, and coffee pot spouts should be cleaned often, as this is where coffee often "goes wrong." If the drip method is used (*Continued on page 957*)

To make perfect coffee with a percolator, fill with fresh hot water. Be sure the percolator is clean before you start, then add the right amount of coffee.

In the drip method, a cheesecloth bag contains the pulverized coffee and the water is poured slowly over it. Remove drip and cover the pot.



Here is an improved type of electric coffee pot which makes coffee by the drip method. This utensil brings the making of good coffee nearly to the point of being automatic and fool-proof.

Here are the details of the new coffee pot. As the water on the right side is heated, the steam generated drives it up through the tube and over the ground coffee. The coffee dripping through, settles in the left compartment.

The boil method of making coffee. A heaping tablespoonful for every cup of coffee you plan to use is employed for each cupful of boiling water. Boil exactly 3 minutes. You can time this with an egg timer.

Two scenes from the German School which teaches the art of make-up for actors, amateurs and professionals.

The ART *of* MAKE-UP

THE ability to transform one-self into an entirely different character with an accompanying change of physical appearance is of prime importance to actors in the portrayal of character rôles. In keeping with the recent rapid advances of the motion-picture industry in Germany, a school was established a short time ago in Berlin for the express purpose of teaching the art of make-up to amateurs and professionals. The curriculum of this welcome addition to the foreign film industry is so arranged that the novice is first thoroughly taught the elementary rudiments of this art and progresses as his ability warrants until, by the time he is ready to "graduate," he is an expert in being able to transform himself into something that he isn't. Who can tell but that this school may be the source of providing movie patrons with future artists who can compare favorably with our own Lon Chaney, who, as most of us are aware, is the inimitable exponent of the art of characterization. This eminent actor, as we well know, is not only able to transform himself into grotesque physical shapes, as well as to change his features, but he can also entirely change his very character and personality. Although Chaney is undoubtedly the foremost exponent of this art, a number (*Continued on page* 947)

By covering the right half of this illustration, one will obtain a realistic effect of the features associated with skeletons; an excellent example of what make-up can do.

The best effect of this illustration may be obtained by alternately covering each half of the face. The right side of the picture shows the features before any make-up is applied.

The illustration above depicts a rehearsal of a scene from "Faust." It shows Mephisto and the Witch "out of character"; while the illustration to the right of this rehearsal scene shows the same actors after the proper make-up has been applied.

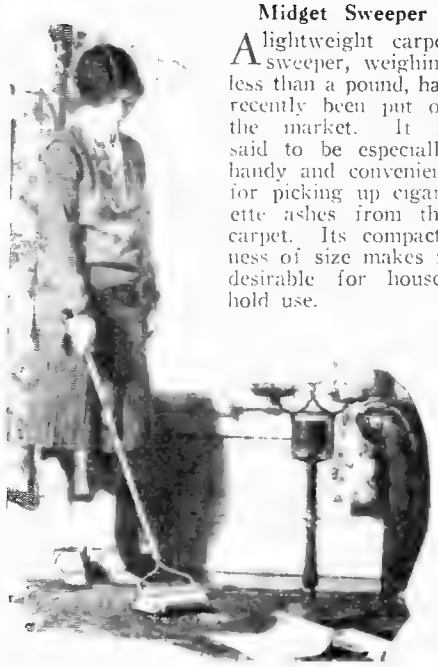
Referring to the above two illustrations we see to the left an actress resembling a young ingénue, while to the right (and directly above) we see the same individual made up to resemble a comical old woman, with a touch of make-up, false nose and hair comb.

The histrionic students are here seen in practical applications of the results of their studies. The individual students are shown in various stages of the art of make-up. The instructor is shown fixing the hair of one of the students; another pupil is working up her eyes; the zigged gentleman next in line is critically examining his artificial nose; while the lady in the foreground is using a powder puff.

Scientific Aids to your Comfort

Midget Sweeper

A lightweight carpet sweeper, weighing less than a pound, has recently been put on the market. It is said to be especially handy and convenient for picking up cigarette ashes from the carpet. Its compactness of size makes it desirable for household use.



Clogless Salt Cellar

ABOVE is a salt cellar with a new attachment which seals the top and prevents salt or pepper from clogging.

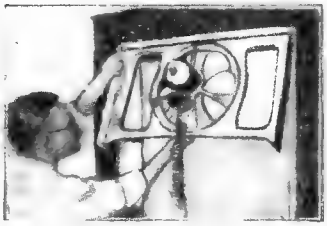
Artificial Sun Bath

Sun Lamp

FOR the city dweller who, during the winter months, has difficulty in obtaining the proper sunlight, a prominent electrical manufacturer has designed a sun-ray lamp, consisting of a carbon arc which reproduces almost exactly the spectrum of the summer sun. The lamp plugs into the electric light socket.

Kitchen Ventilator for Any House

THE kitchen is usually the one room in the house from which everyone stays away. With this new and recently designed kitchen ventilator in use there will be no stuffy air or unpleasant odors to make this room unpleasant.



THE hardwood and metal frame makes this ventilator easily adjustable for any size of window. It can be quickly moved to another position.

THE long cord connects to a reversing switch for the motor.

Names and addresses of manufacturers gladly supplied upon request.

Day-time Table—Night-time Bed

BELOW is a good looking piece of furniture which for day-time use is a table, and at night is converted into a bed. This table provides many advantages, one of which is the saving of space.

Handy Stool

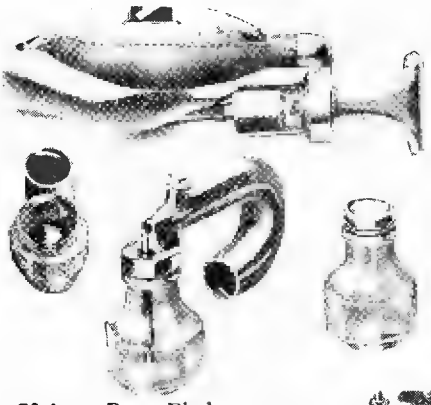
MANY a housewife has spoken some unkindly words when in her efforts to reach for an object on a high shelf, she has tumbled from her precarious perch A manufacturer has recently come to her aid with a duplex stool which is compact in size and of sturdy construction. The housewife may step from one of these stools to the other and reach as high as possible without being in danger of falling. These stools are available in a variety of colors to match the decorative scheme of the kitchen.

Novel Microphone Lighter

A NOVEL and highly efficient cigar or cigarette lighter in the form of a microphone has recently been placed on the market. The lighter comes in a variety of colors, and is designed for operation from 110 volts AC or DC. There are two styles of this novelty, one with an ash-tray, and the other without an ash-tray. A moderate price and convenience of use are the attractive features of this novelty.

AT left is the "mike" lighter.

Midget Vacuum

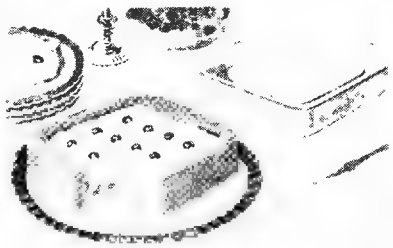


HERE'S a small and handy vacuum cleaner which will find a variety of uses in the household. It costs only a cent an hour to operate, and has special attachments which enable it to be used for spraying deodorants or disinfectants. Its light weight enables it to be easily handled.

Chair by Day—Bed by Night

THIS chair, shown below, may be readily converted into a bed, as shown, by merely pushing out the arms of the chair. This is another convenience for the space-crowded home of the city dweller. It is said to make a good-looking piece of furniture, and will no doubt find many uses. It is so strong that it will hold a heavy man or woman without breaking any springs. The balance is so perfectly adjusted that you are in no danger of tipping yourself over.

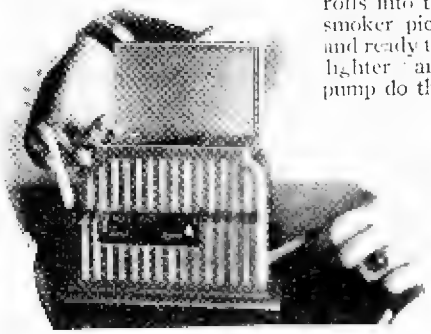
Unique Pans Find Many Uses



AN attractive and moderately-priced pan of unusual construction is shown at the right. A special formed cake is the result when dough is baked therein. This is subsequently filled with fruit or cream

Humidor and Cigarette Lighter

THE smoker is invited to have a cigarette. He pulls down the lever and lets go of it. A cigarette rolls into the tray and smoker picks it up lit and ready to smoke. A lighter and vacuum pump do the work.

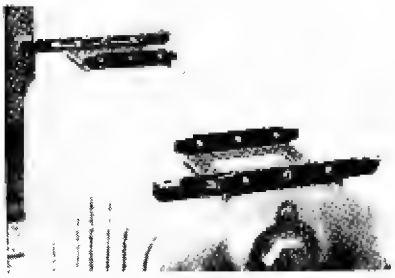


Electric Toasterette

THIS novelty will particularly please the resident of the Middle-west and South who likes his barbecues. It is designed to toast rolls on the inside. The holes are coated with a special preparation.

Handy Radiator Rack

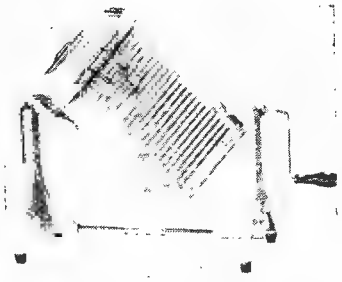
THIS rack consists of two or more brackets which fit over the top of the radiator. A board stretched across them will provide a convenient book shelf or lamp-rack. There is no danger from the heat, as the brackets provide sufficient space from the radiator to assure protection.



Novel Night-Light

THIS is a combination pendant switch and light which automatically lights when large light is turned off, or vice versa. It is said to cut electric bills and provide convenient light for foyers, children's rooms and halls.

Names and addresses of manufacturers furnished upon request.

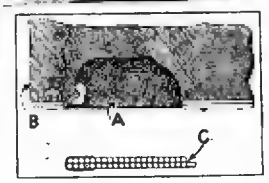


Dry Cleaner and Washer

A MACHINE which may be used for the dry cleaning or washing of any article has recently been placed on the market. It is operated by hand and sells for a very moderate price. The manufacturer supplies a special dry-cleaning fluid to be used with this apparatus which, incidentally, works on the principles of rotation and suction. The machine is very practical and efficient for household use, and no doubt will eliminate costly cleaning bills. It may be used on any sort of material, from dainty silks and rayons to coarse cottons or wools.

Flexible Glass

A SHEET-GLASS which can be bent or rolled has recently been put on the market. Its most artistic application is for lamp shades.

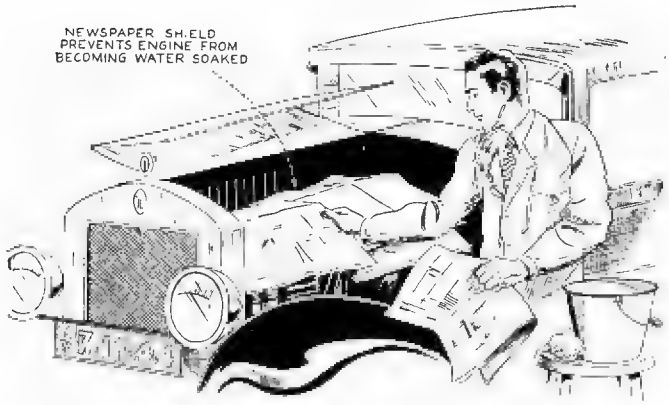


A AND B are crossed glass rods. C is celluloid.

Motor Hints

Helpful Wrinkles for the Owner and Driver

Conducted By Geo. A. Luers



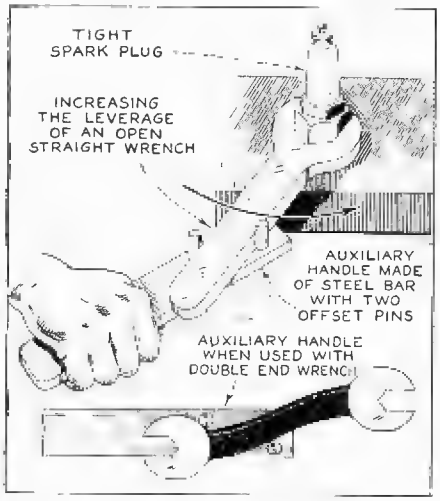
DO YOU KNOW—how to remove the danger when cleaning upholstery, engine and chassis parts with gasoline? Add twenty-five to forty per cent carbon tetrachloride (liquid used to fill fire extinguishers) to the gasoline and it will be safe.

Troubles with Water-Soaked Cars

A SUGGESTION well worth adopting in rainy weather is to cover the motor. The covering need only be newspapers, placed over the top of the engine. The picture shows this means of protection, in which the hood is raised and, after the paper is inserted, the hood is lowered. The water which seeps through the hood will not reach the engine, and the motor will respond quickly to cranking, regardless of rain or melting snow. Remove the paper before the engine gets too hot.

How to Remove Tight Spark Plugs

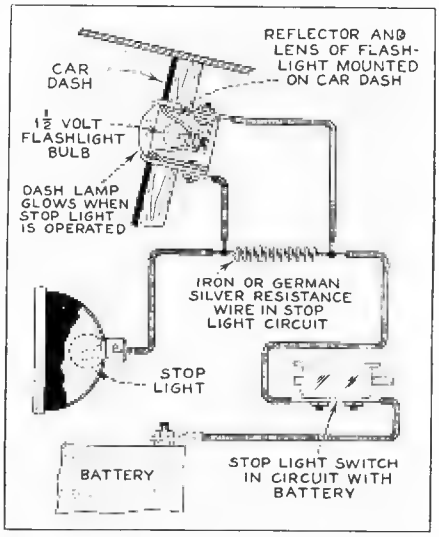
RUSTED bolts are one of the hardest problems for the owner of a car making repairs. These resist all attempts at loosening unless saturated with kerosene previous to using the wrench. Tight spark plugs are another problem. These must be removed hurriedly where the trouble occurs on the road or street. One of the best tools for loosening tight plugs and also tight


TIGHT SPARK PLUG
INCREASING THE LEVERAGE OF AN OPEN STRAIGHT WRENCH
AUXILIARY HANDLE MADE OF STEEL BAR WITH TWO OFFSET PINS
AUXILIARY HANDLE WHEN USED WITH DOUBLE END WRENCH

bolts is an auxiliary wrench handle shown in the sketch. This tool is made by drilling two holes in a bar such as an oversize tire tool and driving two steel pins into them. By means of this extension handle, the wrench leverage can be easily doubled and parts that will not loosen with the usual wrench can be easily moved. A few minutes of spare time can be advantageously expended in making up this tool as an addition to the kit.

Stop-Light Tell-Tale

A SMALL one and one-half-volt flashlight bulb, mounted so as to be flush with the instrument board and in

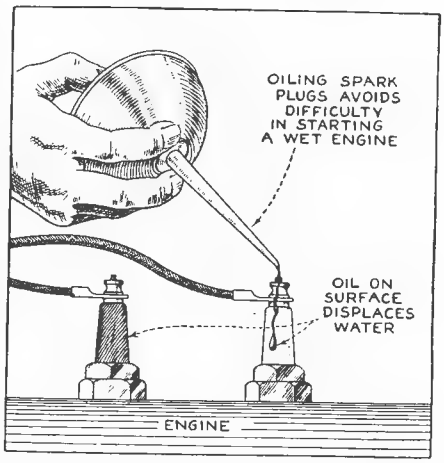

REFLECTOR AND LENS OF FLASHLIGHT MOUNTED ON CAR DASH
CAR DASH
1½ VOLT FLASHLIGHT BULB
DASH LAMP GLOWS WHEN STOP LIGHT IS OPERATED
IRON OR GERMAN SILVER RESISTANCE WIRE IN STOP LIGHT CIRCUIT
STOP LIGHT
BATTERY
STOP LIGHT SWITCH IN CIRCUIT WITH BATTERY

sight of the driver, makes a neat and effective indicator for a stop-light. As will be obvious, this bulb cannot be mounted in direct circuit with the six-volt system operating the stop-light but uses shunted current. The wiring is shown by the attached sketch, in which a small resistance, composed of iron, German silver or other resistance wire, is placed in the lead to the stop-light.

This arrangement does not diminish the voltage to the stop-light to any appreciable extent, and the dash-light is a positive indicator of the operation of the stop-light.

Oil on Spark Plug Aids Starting

OIL squirted on the plugs and wiped around with the fingers provides a film which eliminates the water and prevents short-circuiting. By means of this and by wiping around the top of the distributor with an oil-soaked rag, the ignition will be satisfactory and the engine will respond to cranking, regardless of how heavily it may be raining.



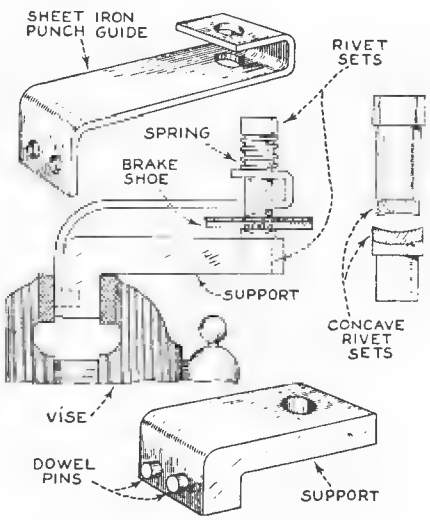
Another good trick is to cover the distributor cap with a piece of old inner tube or other rubber sheeting, held in place by friction tape. Fit the rubber tightly around the high tension wires where they leave the distributor cap.

Riveter Speeds Brake Relining

RELINING of the brake shoes of the car, when equipped with four-wheel brakes, involves twice the work of a car equipped with rear wheel brakes only.

A time- and labor-saver for use in relining work is a vise riveting tool, as shown in the sketch. The difficulties of holding the brake shoe, the rivet set and driving all at one time are overcome with this tool. The brake shoe is seated on the support and the punch is retained in a holder directly above the rivet.

The driving of the rivet is accomplished by striking the punch with a hammer.



Artistic

FINISHES

of Ways and Means for Giving Them an Entirely Applying the Most Mod- of Materials to Walls Finished.

H. Kraus

Photo courtesy Solidon Products, Inc.

Here is the interior of a club-room in which the walls have been finished with one of the modern wall-covering products. The beautiful pattern can be made out by examining the illustration closely. This was applied with a trowel and brushed.

It has a very pretty afterglow and can be used either on an old home or in a brand new structure. The body of

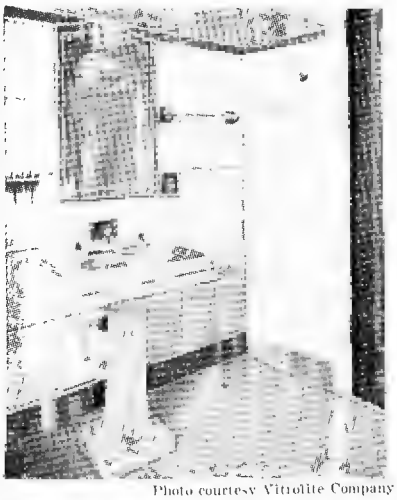


Photo courtesy Vitrolite Company

A very remarkable surface for walls which can be obtained in any color and with which almost any conceivable combination is possible is illustrated in the photo above which indicates a corner of a bathroom. This surface is permanent and washable.

the tile is very permanent and under ordinary strain will not check or break.

"Along the same tile lines there is the Porstelain system of wall tiling which consists of applying enameled finished pressed steel tiles on an insulating base or grooved foundation sheet with a special cement to form a complete clean sanitary surfaced wall of permanence. The foundation sheet is first fastened to the wall and then is covered with cement, after which the metal tiles are set in place. You should have no difficulty in handling a job like that, Harry, as it seems simple enough. You can saw this tile with a fine toothed hacksaw and then cover the edge with a lacquer preparation to keep it from corrosion until you are ready to use it or coat it with cement.

"But, of course, Harry, if you want something more reasonable, something that you can handle even quicker, why don't you try a surface of Beaver Board Asbestos Wall Tile or Sheet Rock? These surfaces all lend themselves for the application of modernistic finishes and can all be so treated as to resemble a tile finish. Take Beaver Board for example. It can be applied in panel arrangements and can be nailed directly to the joists. It will take any form of decorative surface, and for that matter can even be calcimined. It is a good insulator and practically impervious to moisture.

"The Asbestos Wall Tile made by Johns-Manville Company also comes in sheets and has a smooth hard surface in any one of four popular colors. It can be quickly installed by anyone

Photo courtesy Vitrolite Company

This photograph shows how the material indicated in the photo diagonally to the left is applied to the walls. The thin slabs of material are securely affixed to a base foundation of cement.

familar with the use of a saw and hammer and is readily attached to the wall by means of clips and strips of special spring brass. There is no need to dismantle the existing wall but suitable wood grounds to which the clips can be nailed are necessary. It does not crack or chip off in long service and is non-absorbent.

"Then there is Sheet Rock. The United States Gypsum Company, which developed this product has produced

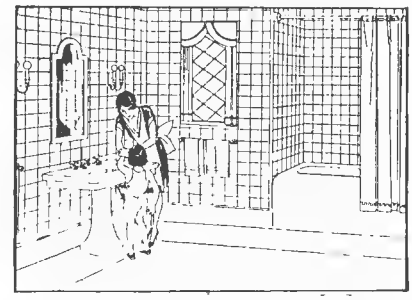


Photo courtesy Certain-teed Products Corp.

A bathroom made up of board-like material properly fastened to the walls of the room. If painted and enameled it is very hard and waterproof.

a new system for applying this to walls, which conceals the joints.

"You will also observe that there are several easy ways of producing three-ply relief effects with another product of a similar nature known as Upson Board. This is also obtainable in tile.

"Now then, when it comes to the surfacing of walls we have something else to contend with. There is Textone, Solidon, and the well-known Keene's Cement. (*Continued on page* 947)

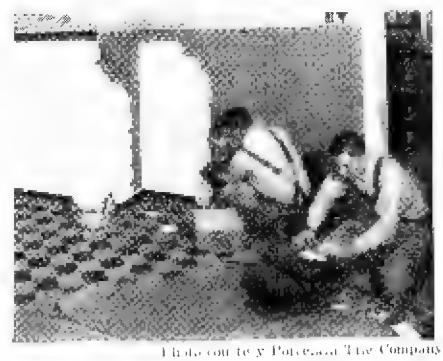
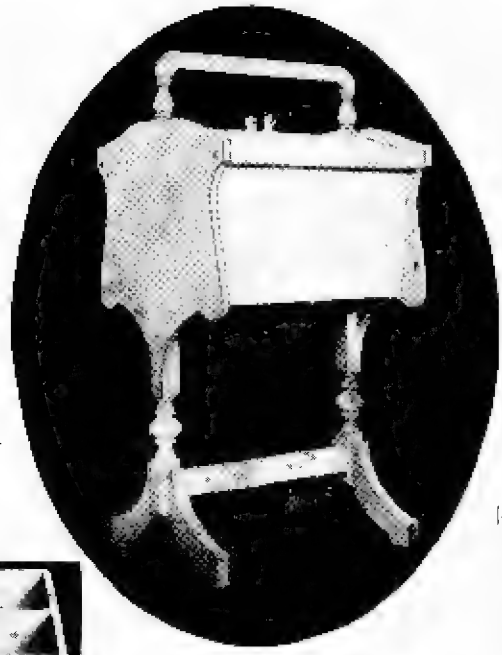


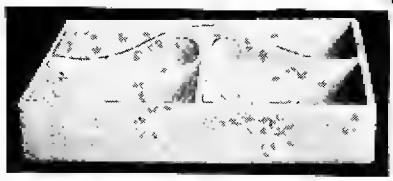
Photo courtesy Portland Tile Company

How enameled finished pressed steel tiles are applied over an old wall upon which an insulating foundation has first been secured. This foundation is covered with cement which holds the rustless tiles in place.

A Priscilla Sewing Stand You Can Build

By H. L. Weatherby





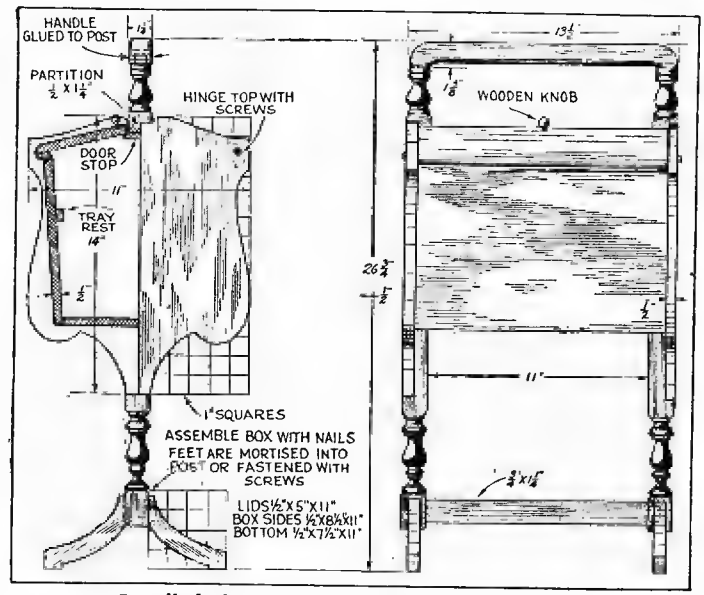
Above is shown the tray, which fits snugly into the sewing stand and may be used to hold all the items which find their way to such cabinets.

From the picture shown above, one will appreciate the beauty and simplicity of this sewing stand. The charm and beauty of line cannot be captured by a manufactured product.

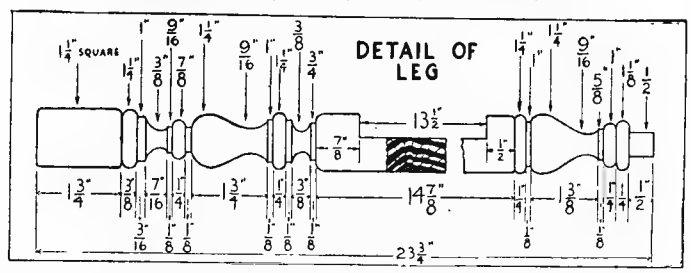
Sturdy of construction, yet handsome in appearance, you will be proud of this piece of furniture.

THE copying of genuine furniture antiques is an indoor sport for bad weather, in which the amateur craftsman can engage with hopes of large returns. Much of the early American furniture is very pleasing in design and the style is very much in demand in the original and in modern copies. The home wood worker, with a small shop equipment, is in a position to duplicate practically any of this furniture in all of its original beauty and charm. There is a fascination that is indefinable about a well-made hand-built piece that machinery cannot put into it, and most of the genuine old furniture was largely hand-made by master craftsmen. The modern craftsman has the advantage of up-to-date tools and methods, and yet his work will still carry the hand-built charm so much desired, without necessarily looking amateurish.

The Priscilla Sewing Stand, or basket, as its name indicates, comes down to us from early American times. It is one of the most useful of antique pieces, and will find a place for itself in the modern home. Its construction is simple, and with a knowledge of wood turning its beauty can be greatly enhanced. It can be made, however, with plain square legs. An optional design is suggested in the silhouette that has a turned handle and more turning in the legs. It can be constructed on the same proportions as the design shown in the working drawing.



Detailed plan of sewing stand, drawn to scale.



Above are the details for turning one of the legs.

In beginning work it would be well to start on the legs. The material selected should be walnut or mahogany, or poplar if a cheaper wood is desired. The legs should be squared to size before turning operations are started, and the cut-out section should be carefully made in each leg at this time also.

Very little has been said in these articles with reference to the turning of squared pieces, a part of which is left square. It requires a sort of technique and some familiarity with turning tools, otherwise the result may be off-center work or splintered corners, where the turned portion runs into the squared part. Extreme care must be taken in centering the wood in the lathe. Of necessity, the work should not operate at very high speed due to the square corners. Care must be exercised in rounding the square corners into the turned part not to cut them back too far and not to allow the tool to catch.

A large detail drawing of the leg accompanies this article, and the dimensions as given should be followed rather closely in order to secure a well proportioned article.

With the legs turned, the hardest part of the work is done. Two small knobs for the lids may be turned between centers in one piece and cut apart by hand. If so desired, the handle may have a center section turned. This is not illustrated, but can be adapted (*Continued on page* 940)

Nicotine—Methane—Phenol

Make These Interesting Chemicals Yourself

By Louis Oberseider

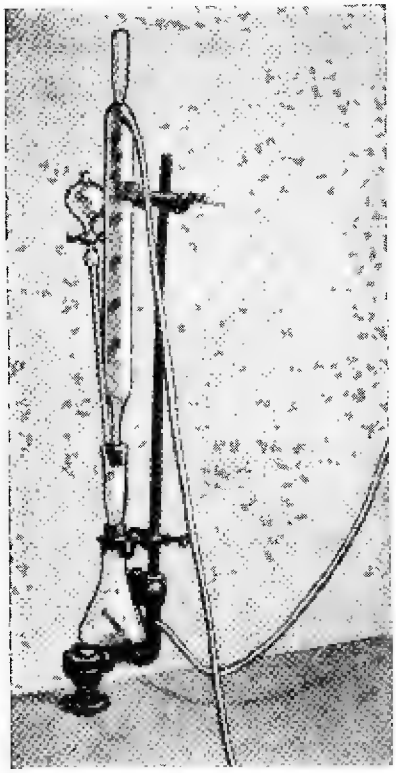


Fig. 1—Sodium benzenesulphonate is prepared by adding benzene, drop by drop, to fuming sulphuric acid in the flask, which is connected to a reflux condenser.

I

Phenol from Sodium Benzenesulphonate

PREPARATION of sodium benzenesulphonate: In a 250 cc. flask place 50 grams of fuming sulphuric acid, connect the flask to a condenser as shown in Fig. 1 and add, drop by drop, 20 grams of benzene. During the addition of the benzene, which should take about 15 minutes, the flask must be shaken vigorously every minute or two. If all the benzene does not dissolve after continuous shaking for a few minutes, heat the mixture on a water bath until solution is complete.

Dissolve 65 grams of sodium chloride in 250 cc. of water, and filter the solution if necessary. Measure off 200 cc. of the solution, and reserve the rest for washing the crystals of sodium benzenesulphonate. Pour into 200 cc. of the salt solution, slowly and with stirring, the mixture of benzenesulphonic acid and sulphuric acid. Cool the mixture, and if crystals do not separate, scratch the inner sides of the vessel of the mixture with a glass rod. Let the crystals stand with the mother-liquor for about 15 minutes to insure the complete separation of the salt. Filter and drain off as much of the liquid as possible by pressing the solid down firmly with a spatula. Wash the salt with a part of the sodium chloride solution which was reserved for this purpose, then wash again with the remainder. Draw off as much liquid as possible, and transfer the sodium benzenesulphonate to several thicknesses of filter paper to dry by pressing.

Preparation of phenol: In an iron dish melt 50 grams of sodium hydroxide after adding 2-3 cc. of water. Add gradually 10 grams of powdered sodium benzenesulphonate, stirring constantly. Keep fused for 20 minutes, but do not heat much above the fusing point. Cool and dissolve in 200 cc. of water. Add concentrated hydrochloric acid until the solution is only slightly alkaline, and filter to remove iron hydroxide. Acidify the filtrate, cool and extract with 100 cc. of ether in three portions. Unite the ether extracts and evaporate the ether on a water bath, using the usual precautions. Transfer the residue to a small flask equipped with a thermometer and attached to an air condenser as shown in Fig. 2 and add a few cc. of ether. Distill off ether again and then distill over phenol, which boils at 183° C. If pure, it will solidify on cooling. Tests:

(1) Dissolve a little in water and test solution with ferric chloride solution; a violet coloration results.

(2) Add bromine water to a portion; tribromphenol is precipitated.

While these experiments are simple, they require care to avoid accidents.

II

Dinitrobenzene

Mix 50 cc. of concentrated H_2SO_4 and 50 cc. of fuming HNO_3; without cooling, add dropwise from a separatory funnel under hood 10 cc. of benzene to mixture of acids contained in a Florence flask, shaking constantly. When all has been added, boil mixture 10 minutes, allow to cool and pour into 500 cc. of cold water. Filter all the dinitrobenzene which precipitates, and if desired recrystallize from alcohol.

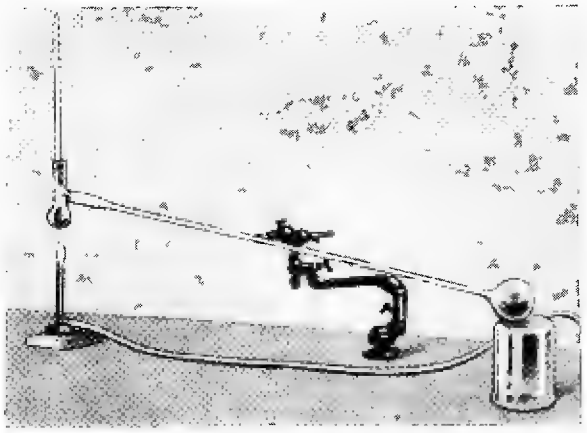


Fig. 2—The phenol is distilled from a small flask with an air condenser. A thermometer is attached to the flask. Phenol boils at 183° C.

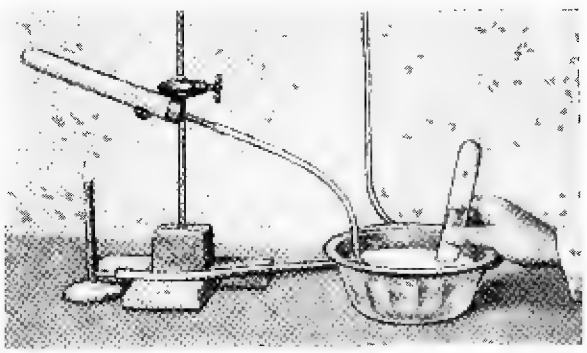


Fig. 3—Methane or marsh gas, CH_4, is prepared by heating soda-lime and sodium acetate, thoroughly mixed, in a test tube. Collect the gas over water.

III

Nicotine from Tobacco

In a small flask boil together one cigarette, 25 cc. of water and 2 cc. of diluted sulphuric acid. At the end of 10 minutes add an excess of a solution of sodium hydroxide, connect the flask with a condenser and distill over about 10 cc. of the solution. The alkaloid may be precipitated from this solution by adding to separate portions of it certain alkaloid reagents as tannic acid solution, solution of iodine in potassium iodide, solution of potassium mercuric iodide and mercuric chloride solution.

IV

Methane from Sodium Hydroxide, Acetic Acid and Lime

Dissolve 8 (*Continued on page* 950)

P. T. Glider built by Lieut. H. A. Reynolds in flight at Sentinel Hill near Syracuse, N. Y. Martin P. Schempp, German Glider "Ace," piloting.

Lt. Reynolds

Builds and Flies

GLIDER *from* S & I *Plans*

Practical Construction Hints on the Building of a Primary Training Glider of the Type Described in June Issue of This Journal. The Author writes from Practical Experience Gained in the Actual Building and Flying of the Glider.

By Lieut. H. A. Reynolds

BUILDING a Primary Training Glider is the logical step after model building for the young man who wishes to become adept in the air. The writer knows from experience that more than one Primary Training Glider is needed for the proper operation of a Glider Club. A broken wire or wooden member will cause suspension of gliding operations for the day and disappoint club members as well as onlookers if a second glider is not available. It is not difficult to construct a P. T. Glider from the plans and specifications by Marvin A. Northrop as presented by SCIENCE AND INVENTION in the June and July numbers.

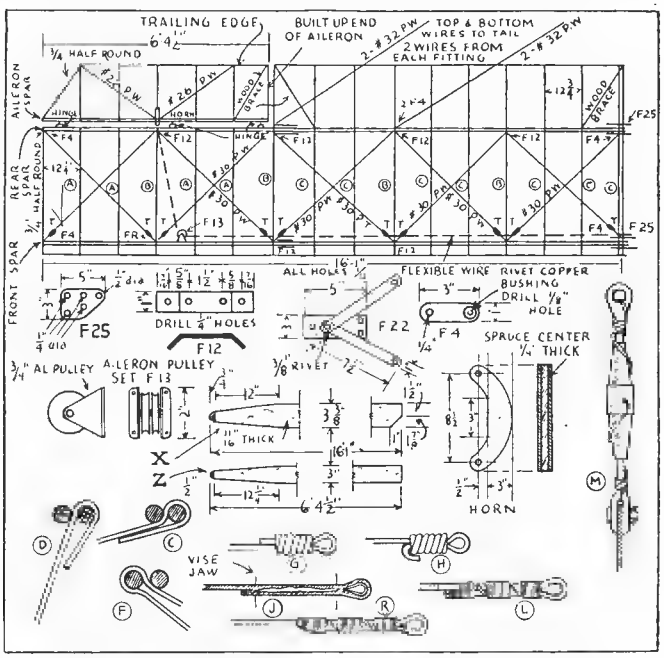
It is the intention of this article to follow the construction of this machine step by step presenting easy solutions to the difficult points which confront every builder.

The most tedious part of making a glider is the construction of the ribs. ¼" x 5/8" strips of spruce are ripped into battens about five and one-half feet long and sanded to fair smoothness. 125 of these will be sufficient.

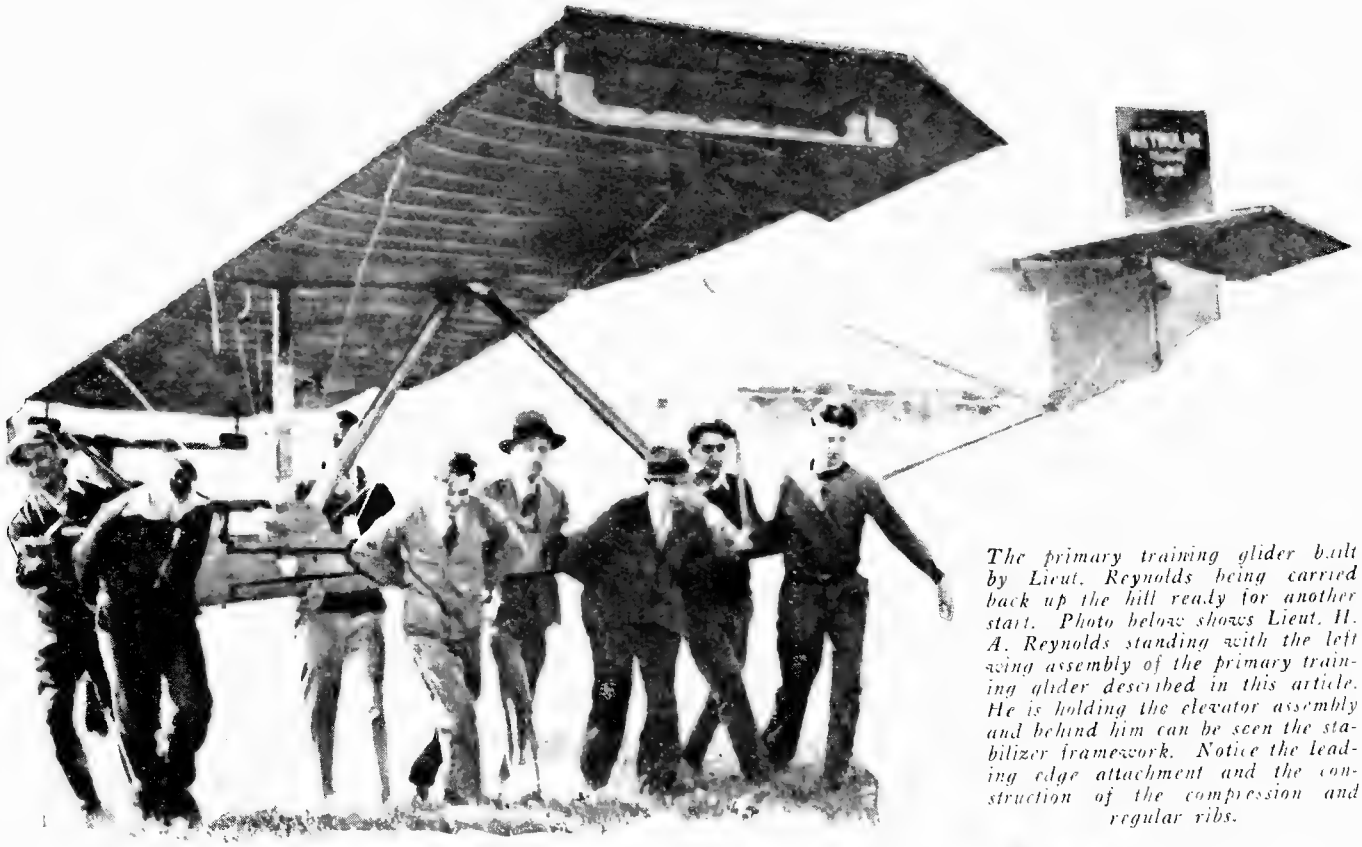
The plans call for three different types of ribs called A, B, and C to be used and necessarily three separate gigs have to be built to form them. A different method is presented here which requires only one gig to form all the ribs and shortens the work considerably without sacrificing strength or increasing the weight of the wing and glider.

A smooth pine board six feet long and ten inches wide with sufficient thickness to make it rigid is used to make the gig for forming the ribs. The outline of the airfoil is drawn on this board and the position of the spars, upright strips, and diagonal strips, are carefully drawn using rib "B" of the original plans as a guide. Next a ½" thick pine board six feet long and ten inches wide is sawed out to the outline of the airfoil and securely glued or nailed to the first board making a sunken airfoil outline ½" deep.

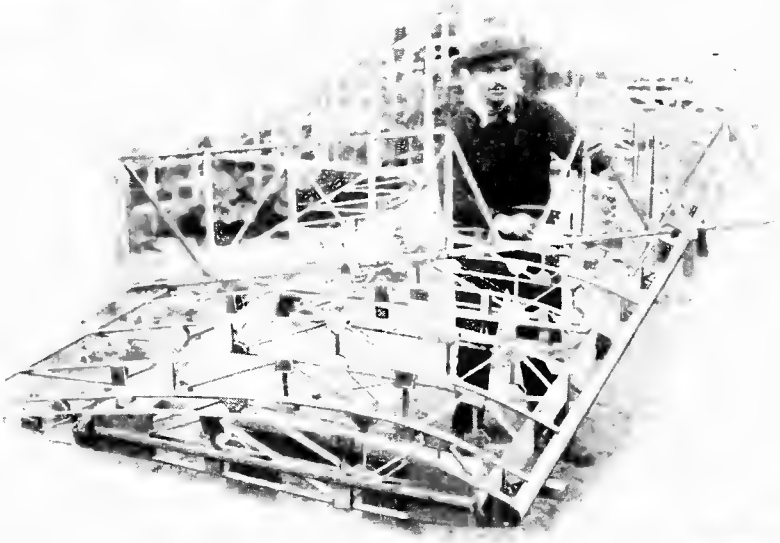
One of the glider crews pulling on the elastic shock cord.



The drawing above shows details of wing construction, as well as the dimensions and shape of some of the important parts. Of the part labeled F25 make 8, from No. 12 carbon steel; of the part labeled F12, make 16 of these from carbon steel No. 14. Of the Part F22 make 8 of No. 10 carbon steel. Referring to the horn in the lower right-hand corner, the quarter-inch-thick spruce center has ply-wood glued on each side. Make 5 of these horns from spruce and ply-wood. Further details are explained in the text. (See also the June and July issues of this magazine.)



The primary training glider built by Lieut. Reynolds being carried back up the hill ready for another start. Photo below shows Lieut. H. A. Reynolds standing with the left wing assembly of the primary training glider described in this article. He is holding the elevator assembly and behind him can be seen the stabilizer framework. Notice the leading edge attachment and the construction of the compression and regular ribs.

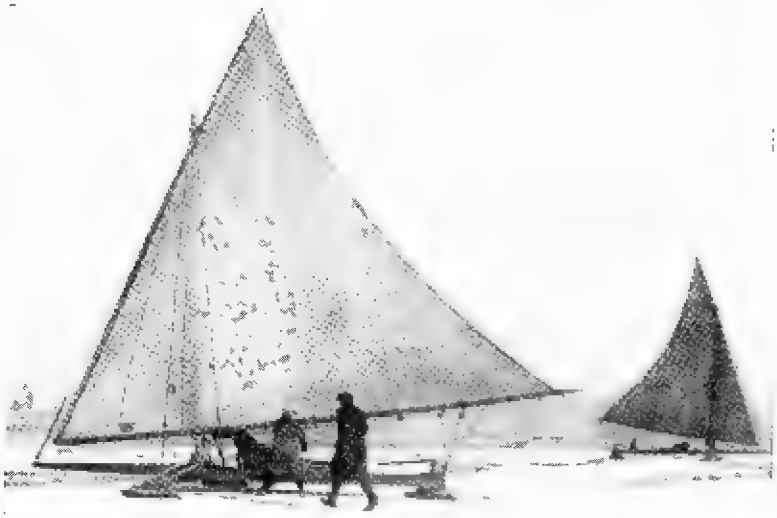


Pieces of pine are cut to conform to the outline of the upright and diagonal strips so that the rib shape will appear in sunken relief ½" deep. It is best to have this ½" series of grooves 3-16" wide to facilitate easy fitting of the ¼" spruce battens and strips when assembling the rib. The nose or leading edge of the whole gig is next sawed off square 1" back from the leading edge of the airfoil line. The trailing edge is also sawed off square at 3" forward from the trailing edge of the airfoil line. This allows the top and bottom battens to protrude beyond both ends of the gig when forming the rib. When this is completed you have a gig or form in which to shape and make all the ribs necessary for the wings.

To make a rib two of the ¼" x ⅝" spruce strips are inserted, one in the top and one in the bottom, in the horizontal gig grooves with the surplus of their lengths equally protruding from both ends of the gig. The upright pieces of ¼" x ⅝" spruce are next cut and inserted in their proper places and in the same manner the diagonal pieces of ¼" x ⅝" spruce are placed. Plywood gusset plates are cut in triangular shape about 2½" on each side and these are glued and nailed to the battens to hold it together at the joints. About six square feet of 1/32" Plywood can be purchased from the Heath Airplane Co. 1721 Sedwick St., Chicago, Ill. It cost about $1.50 and will be sufficient for all the ribs. Three or four pounds of Casine Glue will be sufficient for the whole ship and may be secured from the Heath Airplane Co. for fifty cents a pound. Mix a small quantity of the glue, sufficient for the job at hand until you have a thick creamy paste. You may use either cold or warm water and glue should be mixed fresh every day, and spread with a generous brush. The writer would suggest daubing the rib joints well with glue and also painting the inside of the gusset plate before it is placed in position to be nailed with 3/8 x 21 flat headed wire nails. Next lift rib out of gig and repeat gusset plating on the other side.

Make 14 Regular Ribs as pictured in Plate No. 1. Make 8 Compression Ribs which must be constructed the same as the Regular Ribs except that 4 battens ¼" x ⅝" must be glued and nailed (2 on a side) as pictured in Plate No. 1. Make 8 Aileron Ribs which are formed in the same manner as the Regular Rib with the exception of the upright pieces and triangular gusset plates in the section back of the Rear Spar opening. This section of the Aileron Rib is left open for insertion of the Aileron Spar later on in the construction. The writer suggests gluing and nailing plywood upright plates to each side of the battens about half way (*Continued on page* 936)

Martin P. Schempp, German Glider "Ace," about to take off in P. T. Glider built by Lieut. H. A. Reynolds, Syracuse, N. Y. Note the double shock cord.

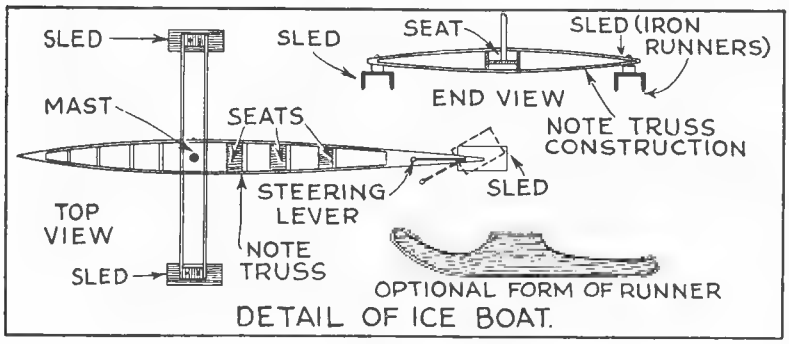


ICE

You Will Enjoy Building and Winter Sport Devices. They Should Be Painted in Gay Recommend the Ice Boat Minute Speed at

Travel Mile-a-Minute in Ice-Boat

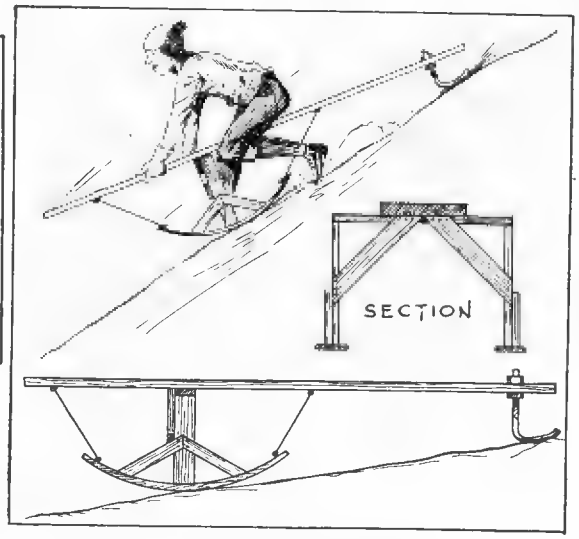
YOU don't know the thrill of winter sports until you ride an ice-boat. At the left may be seen one of these speedy craft, which may be constructed with the usual tools found at home.



DETAIL OF ICE BOAT.

Flat-Iron "Curling" by Floodlight

THE game of curling has been known for some time. Mr. L. B. Robbins suggests a means of lighting an ice-skating pond, so that this game may be played at night. The floodlights can be made from four old auto headlights. Remove the original bulbs, if of the legal 21 c.p., and replace with 32 c.p. double-contact bulbs. The lights are then mounted on a block of hard wood 6 inches square, one to each side as indicated, so that they point in four different directions. Fasten a 1¼-inch pipe flange to the center of the bottom of the block, into which should be threaded a pipe at least 6 feet long, as shown in the diagram in the lower right-hand corner of the page (*Continued on page* 945)



Hillside Ice Skooter

THIS coaster is made from two barrel staves, a plank, some short pieces of 2" x 4" wire and a small pipe about 2 feet long. The staves should be of the same size.—*D. R. Van Horn.*

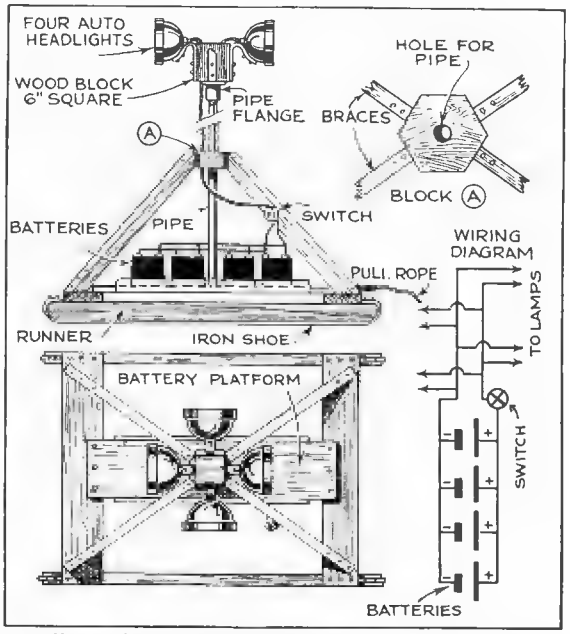
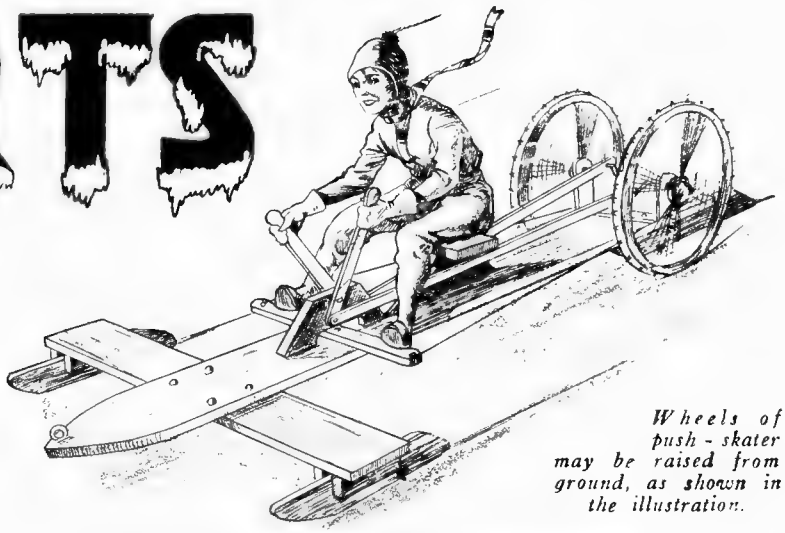


Illustration above shows complete layout for mounting of floodlights. Wiring diagram or battery and light circuit is shown to the right.

SPORTS

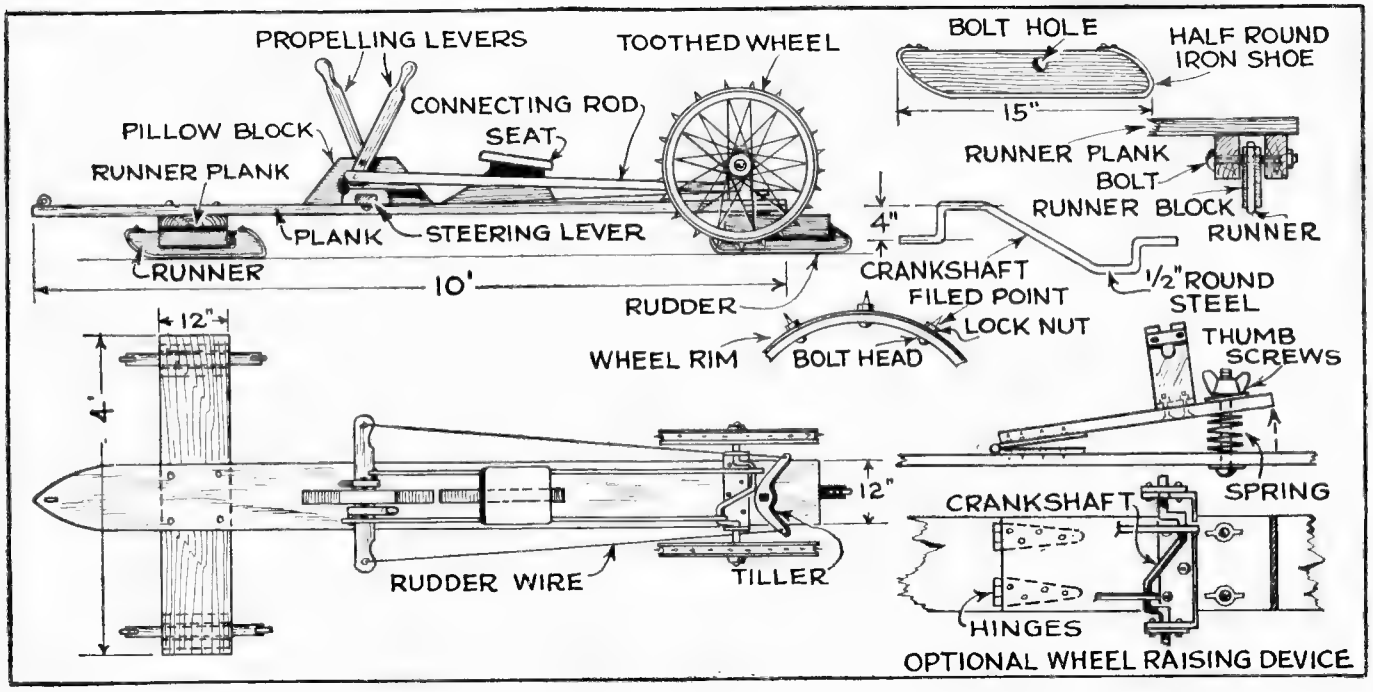
Using These Simple Designs of Are of Low First Cost and Colors. We Particularly —It Provides Mile-a-Minimum Cost



Wheels of push-skater may be raised from ground, as shown in the illustration.

How to Build a Push-skater

THE more variety to ice sports, the better, and when this push-skater appears on the lake you will thrill the crowd.



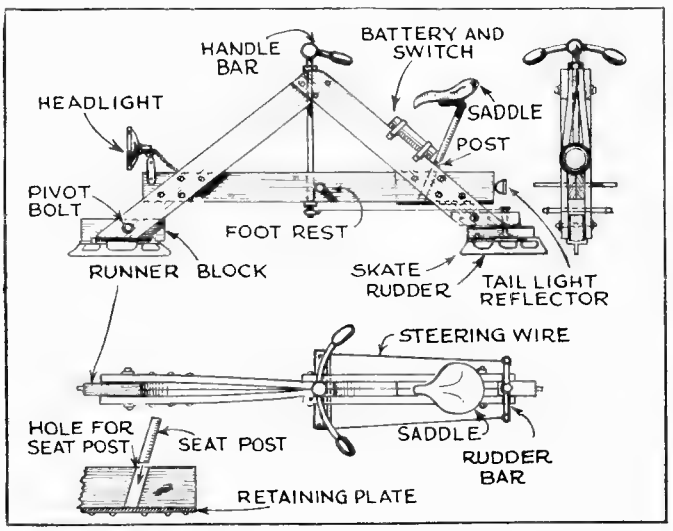
Skating Down Hill

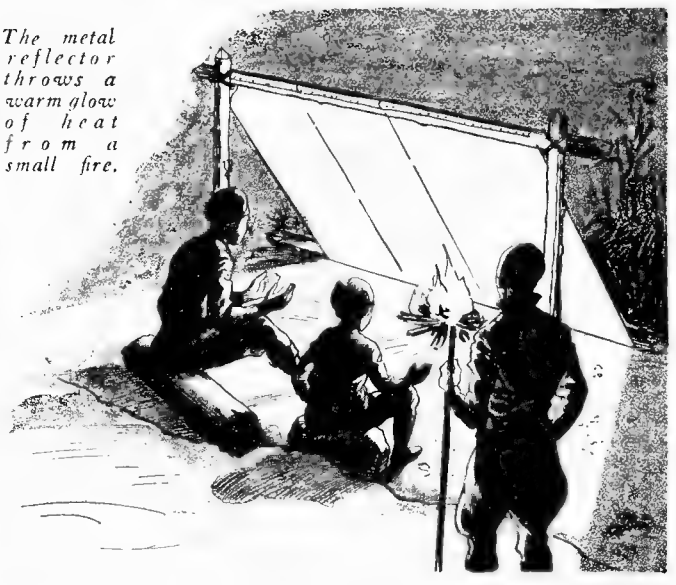
FIRST you will need six pieces of clear-grained board 6 in. wide by 7/8 in. thick. The length, roughly speaking, should be about 4 ft. long for the diagonals, and for the bottom strip about 5 ft. in length. Each section of the frame consists

(*Continued on page* 945)

Skater's Warming-Oven

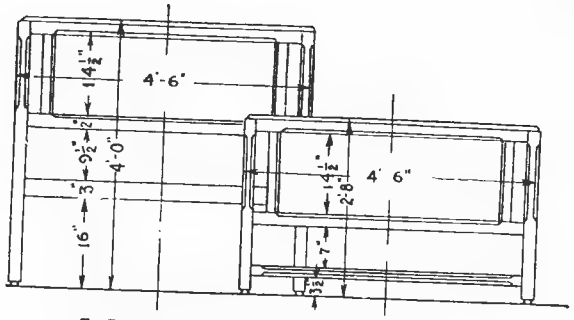
WHEN the pond first freezes over, why not set up this warming oven on the bank so that you can quickly warm your hands and feet later on? Even a small fire with this metal deflector will throw a lot of heat.—*D. V. H.*



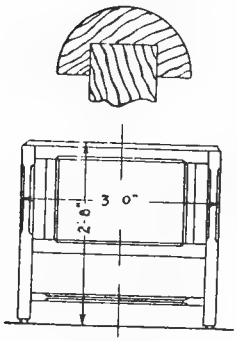


The metal reflector throws a warm glow of heat from a small fire.

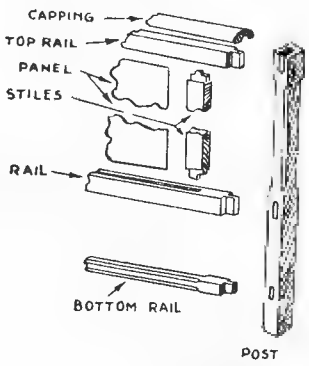
Homecraft Wooden Bedstead



ELEVATION OF HEAD AND FOOT

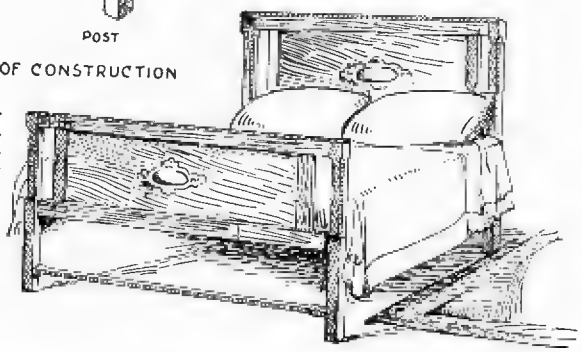


AS A SINGLE BED



DETAIL OF CONSTRUCTION

The above illustration gives all the necessary details for constructing the bedstead described in the text. The design is intended for use with the usual metal sides.



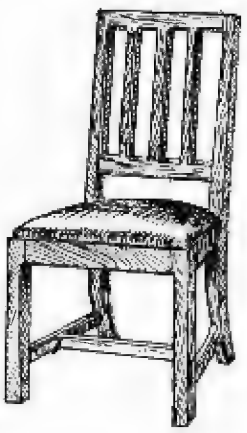
The completed bedstead is illustrated at the right. The construction is quite simple, mortise and tenon joints being used throughout.

THE wooden bedstead has grown quite popular of late. If well constructed, it is both sanitary and rigid and has a far handsomer appearance than that of the metal bed. The design here illustrated is intended for use with the usual metal sides. Elevations of the head and foot of a full-sized bed are given, but for readers requiring a single-sized bed, an elevation of 3 ft. is also shown. The head can be made similar to that of a double bed, the width being altered. The construction is quite simple, mortise and tenon joints being used throughout. The 2 in. × 2 in. posts have stop chamfers, as shown, and the rails and stiles are 1 in. in thickness. These are grooved to receive the panels, which may be either solid or of oak-veneered plywood. A half round capping is fitted to the top rails. Fret cut ornaments are glued to the panel centers. Care must be taken to avoid a surplus of glue, for if this substance remains in the corners, it is not only unsightly but rather difficult to remove. Small shallow casters should be fitted to the feet. The iron fittings are screwed to the posts, so that the top of the side rails are about 14 in. from the floor. All the necessary constructional data as to the dimensions will be found in the accompanying drawing. The bed, of course, can be finished to suit the individual.

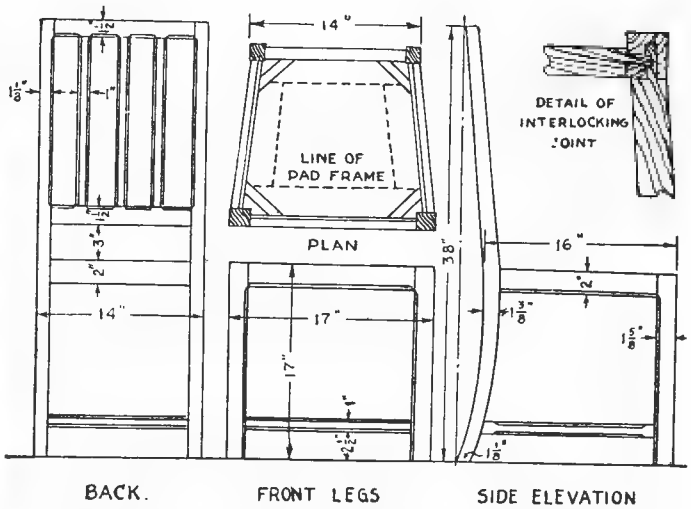
If troubled by excess glue showing at the joints, it can be easily removed by a rag moistened thoroughly with very hot water. Do not try to chip it off.

Making a Bedroom Chair

THE simple chair here described is intended for our bedroom suite, but it would be quite suitable for the dining or sitting room. The sizes shown on the drawings are, of course, "finished sizes," and allowance must be made for planing. A gentle rake, 2 in. deep in the middle, occurs in the back legs. To avoid waste, these should be set out side by side on the same board. The legs only are curved, the upper back being quite straight. The rails and bars of the back are mortised and tenoned together, the inside edges being chamfered as shown. The two back rails are shown flat, but both comfort and appearance will be improved by making them slightly curved. A curve ⅜ in. deep would be sufficient. The seat frame rails are carefully tenoned into front and back legs, the tenons being long enough to meet and mitre. The joints between the seat rails and back legs are subject to very severe bending stresses, and if the interlocking joint, shown in detail, is used here, a much better job will result. The front legs and front and side seat rails are finished with a ¼-in. chamfer on the inside angles. The stretchers are also chamfered. When cutting the side stretchers remember to cut the back shoulders aslant, so as to coincide with the backward sweep of the legs. Dovetail joints are used to fix the cross stretcher. Rebates must be worked in the seat rails to take the loose seat, and the inner corners of the front legs must be cut away to continue the rebate all around. When assembling, glue the front and back independently, and add side rails and cross stretcher after the glue has set. The frame may be stiffened with angle braces, which also give extra support to the loose seat. The seat frame is halved together, and finished ⅛-in. small all around, to allow for thickness of upholstering. The lift-out seat should be covered in some gay color. A herring-bone striped linen is very suitable. See that the seat fits rather tightly in place. Often it is advisable to screw it from below, lest it tip out.—*J. E. Lovett.*



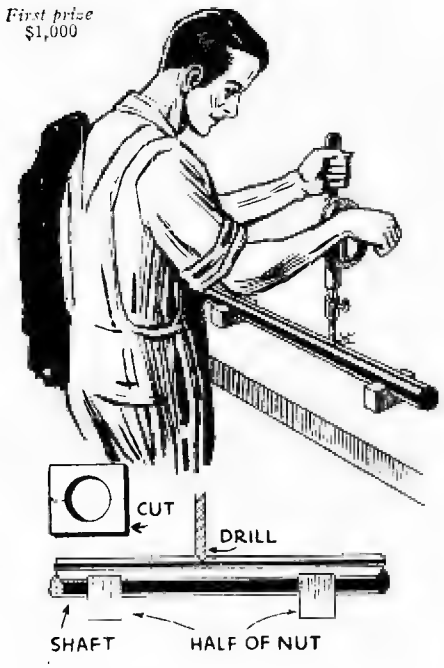
FINISHED BEDROOM CHAIR



Plans for the bedroom chair appear above. A back and side elevation are shown, as well as detail of the interlocking joint. The finished chair is shown at the left.

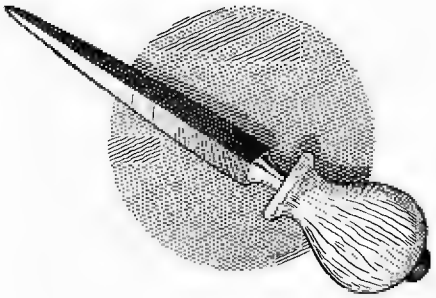
HINTS *for the* HOME WORKSHOP

First prize $1,000



Shaft-Holder for Drilling

MANY readers have no doubt experienced much difficulty with drilling a hole through a round shaft. A good way to obviate this trouble is as follows: Take an ordinary square nut and cut it in half with a hack-saw. Place shaft inside either half of the nut, as shown in diagram.—*M. L. Escobar.*

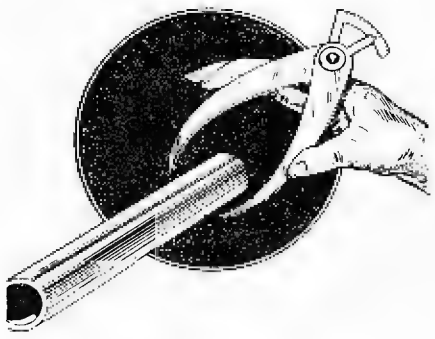


Door-Bumper for File Handle

A VERY convenient and useful handle for a three-cornered file may be made from a bumper used ordinarily to prevent doors from banging. Merely insert the handle end of the file into a drilled hole in the bumper. — *Louis Andrews.*

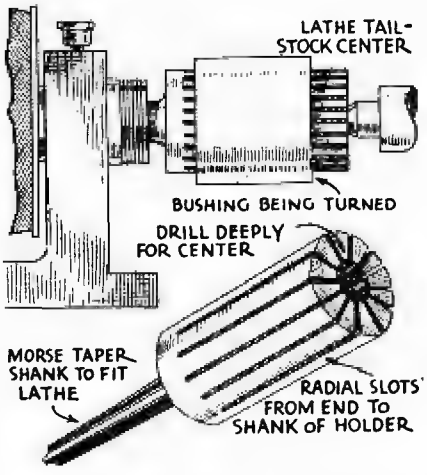
Measuring Calipers

IT is always easy to purchase good calipers, but to make them self-reading it is merely necessary to put a metal scale and indicator on the top of the calipers. One of these attachments should have attached to it a small arc of metal calibrated to any desired scale. This is an easy and desirable method of avoiding inaccuracies when doing lathe-turning work.—*John M. Caulfield.*



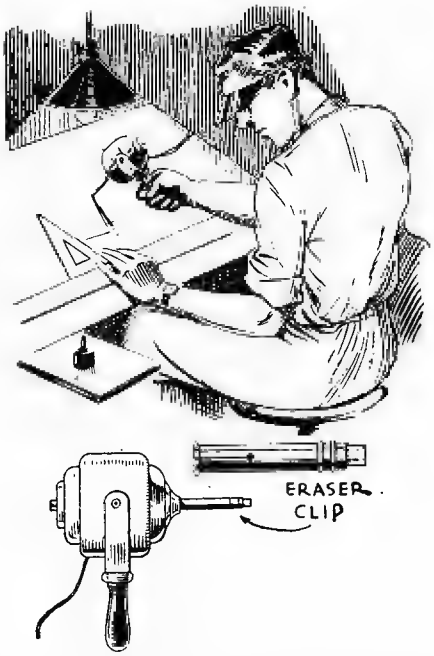
Novel Chuck for Turning

IN turning a large number of bushings, one shop adopted the special form of mandrel shown by the accompanying sketch. The feature of the mandrel is that the bushing is only a hand push fit on the mandrel; the expansion and grip being obtained through pressing the tapered point of the lathe tail stock center into the split end of the holder. The center is kept well oiled while using, and consequently does not score or wear the tail stock center. This mandrel was found to be very efficient. It saved the time of pressing the bushings on and off a tapered mandrel and consequently reduced the costs. It also has the advantage of simple construction and low cost.—*G. A. Luers.*


LATHE TAIL-STOCK CENTER
BUSHING BEING TURNED
DRILL DEEPLY FOR CENTER
MORSE TAPER SHANK TO FIT LATHE
RADIAL SLOTS FROM END TO SHANK OF HOLDER

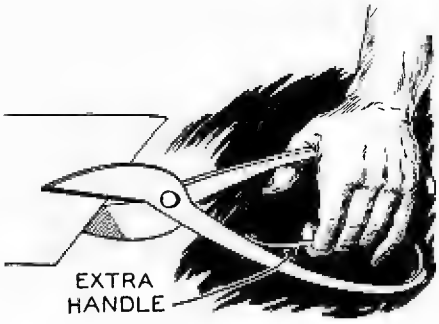
$10.00 MONTHLY FOR BEST HINT

SEND us a photograph or sketch of your own hint for the home workshop. $10.00 is paid monthly for the best hint accepted and published. Others that we publish are paid for at regular rates. Here is a chance for you to win a prize for a useful workshop hint.



Handy Electric Eraser

A RATHER handy tool to have around the drafting room, office, or any place where an eraser is used constantly is an electrically driven eraser. This may be made with a small face massager, as shown in the diagram above.—*Donald Bridges.*

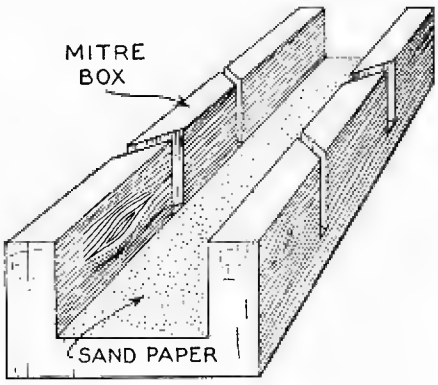


One-Hand Pliers

SCISSOR-TONGS are sometimes very hard to operate with one hand if the handles are far apart. A good way to remedy this trouble is to attach another handle, as marked by the arrow in sketch.—*H. Teastrom.*

Non-Slipping Mitre Box

A PIECE of sandpaper glued to the bottom of a mitre box counteracts any tendency of the wood to slip when it is being cut. This method has been found to be both practical and simple.—*H. Cobb.*



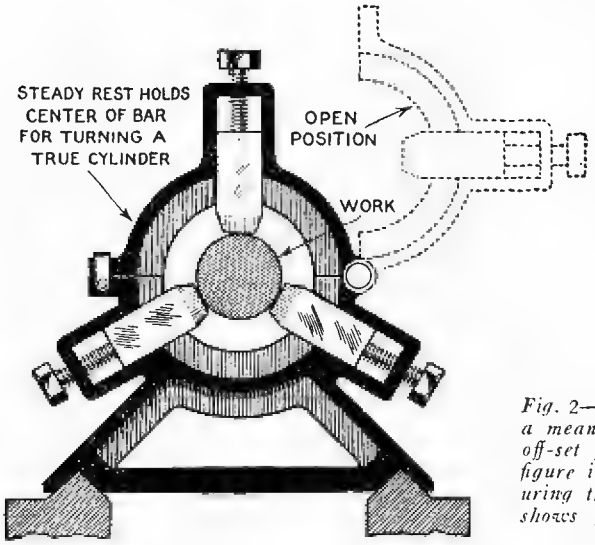


Fig. 1—At the left is shown a support for the center of a long shaft. The rest is secured to the ways of the lathe bed, and screw jacks are used to tighten the fingers to hold the shaft in place.

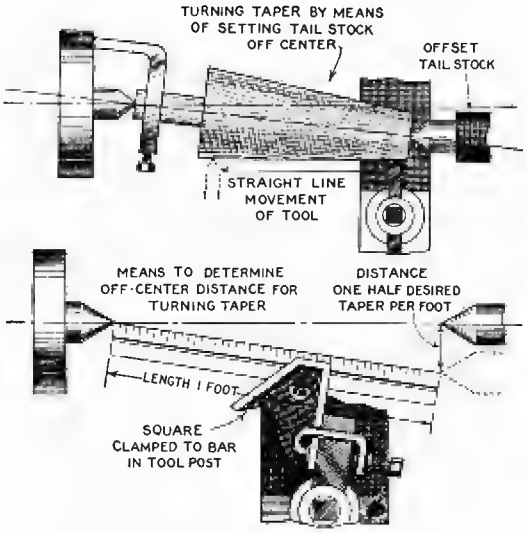

TURNING TAPER BY MEANS OF SETTING TAIL STOCK OFF CENTER
OFFSET TAIL STOCK
STRAIGHT LINE MOVEMENT OF TOOL
MEANS TO DETERMINE OFF-CENTER DISTANCE FOR TURNING TAPER
DISTANCE ONE HALF DESIRED TAPER PER FOOT
LENGTH 1 FOOT
SQUARE CLAMPED TO BAR IN TOOL POST

Fig. 2—At the right is shown a means of determining the off-set for tapering. Lower figure indicates way of measuring this, and upper figure shows position of metal in lathe.

TIPS *for* The YOUNG MACHINIST

Supporting Centers of Long Shafts

ANY play or spring in the center of a shaft, while the tool is cutting through this area, will result in a large diameter at the center. This condition naturally prevents making the diameter uniform unless means to correct this are used.

In Fig. 1, a three-support steady rest of the usual construction is shown. This rest is secured to the ways in the lathe bed, and does not move during the cutting operations, being placed on the shaft or work where it will not interfere with the tool. It is possible of course to move this and start a cut on the opposite side. It is necessary when using the steady rest to first true up a small spot on the work where the fingers of the rest will bear, the diameter being unimportant and if necessary can be followed through with a second cut after the steady rest is shifted.

Determining Offset for Taper Turning

A SIMPLE, direct way of determining the offset of the tail-stock for taper turning may be obtained by

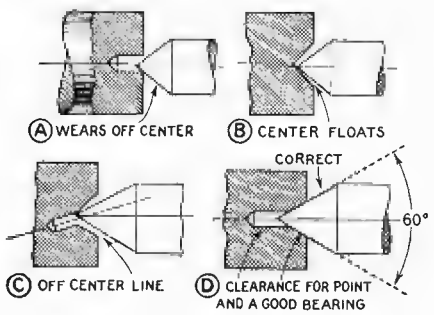


Fig. 4—The incorrect and correct positions for aligning the tail center of a lathe to the center of the metal are shown above.

How to Do Cylindrical and Taper Turning on the Lathe

By George A. Luers

means of a one foot rule mounted on a square body and clamped to the tool in the tool holder, the extreme end is

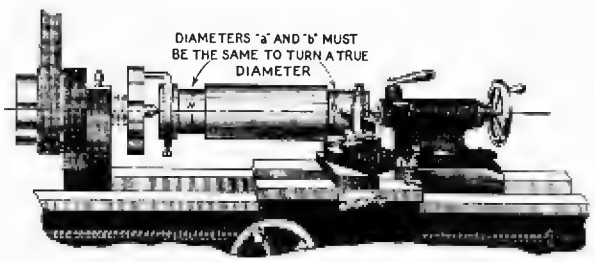


Fig. 3—Diagram above shows means of obtaining identical diameter for both ends of the shaft.

set off one half an inch. The other end of the straight scale is on the face plate center. While the scale is clamped in this position, the tail-stock is moved over so the center coincides with the end edge of the scale, that is, one half an inch. This setting will hold for any piece of work one foot in length between center bearings. For a piece of work larger or smaller, the proportions for offsetting should be changed accordingly.

As roughing cuts are made on the work, the ends should be calipered and checked against the desired dimensions. If the small end is too small, move the tail-stock closer to the center of the lathe ways; if too large, move the tail-stock center farther off the center of the lathe ways.

The Lathe Center Pivots

ONE essential to turning cylindrical work, that is, where the section of the bar or shaft shall be of uniform diameter, is that the lathe centers be in line. If not in line, one end of the cylinder will be of a different diameter than the other. Fig. 3 illustrates a simple test for alignment of centers. In this the bar is first drilled with centers, each end, fitted with a lathe dog, placed between the lathe centers and made ready for turning. The tool is made to cut the bar at point "a" to a diameter above that finally desired. Without disturbing the tool setting, the tail-stock center is withdrawn, the work is held to one side and the tool is run on the feed screw until at the location "b". The work is then centered and a cut is made at this position "b." The diameters at "a" and "b" are then compared, using calipers or micrometer. If there is a variation of diameters, the tail-stock is adjusted laterally, other trial cuts are made, repeating the previous procedure. When the cuts register the same diameters, the lathe tail-stock is in proper position to proceed with the work.

Other methods of checking up the two lathe centers are known to machinists and may of course be applied.

(*Continued on page 961*)

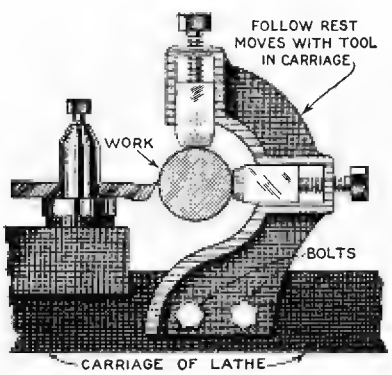
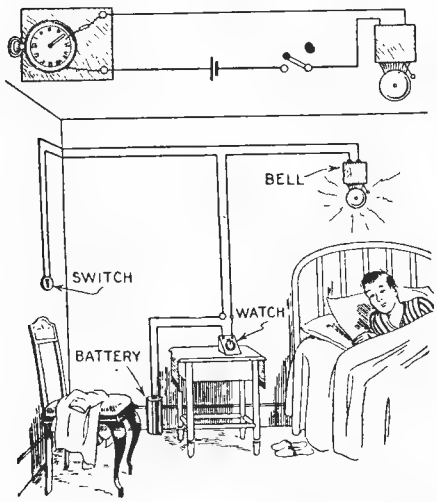


Fig. 5—The diagram above shows how to arrange a steady-rest when turning long, flexible parts.

How to Make It

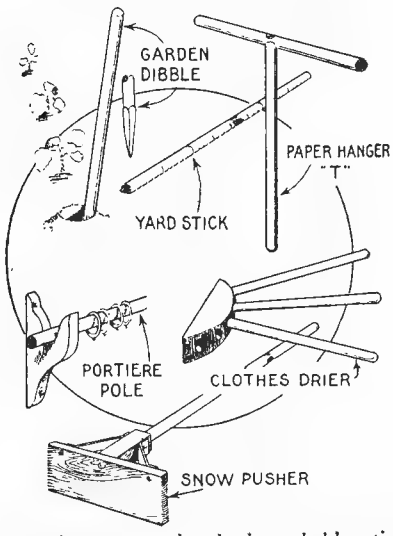
If You Must Get Up Early!



TO cure my propensity for late sleeping, I procured an old watch and arranged it in the following manner:

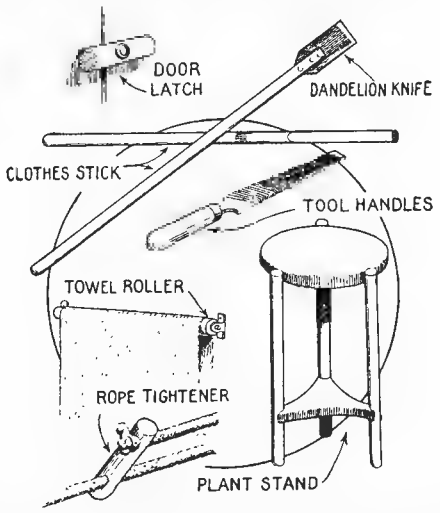
I took off the remainder of the minute hand and filed its driving spindle down below the surface of the watch face. To the remainder of the hour hand I soldered a piece of bus-bar wire about an inch and a half in length. The bus-bar was made to come in contact with a light spring fastened to a suitable base, closing an electric-bell circuit.—*Walter M. Ridgwell.*

Broom-Handle Mechanics



Some of the many handy household articles to be made from broom-handles are shown above.

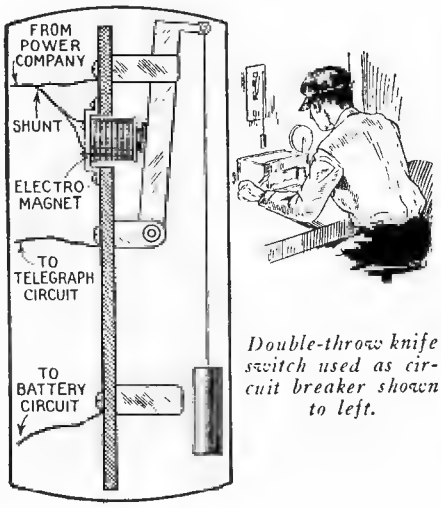
MANY useful and helpful articles can be made out of old broom handles after the broom is worn out. Being hard wood, these handles are very strong and articles made of them will give good service. In working with these handles, holes must always be made for screws or nails, as they are easily split. A hack-saw or other fine-toothed saw must be used to cut the handles so as to do a smooth job. Articles for interior use can readily be finished with lacquer in bright colors, making them very attractive.—*Harold Jackson.*



Door-latch, towel-roller, tool-handles, are a few of the articles using old broom-handles.

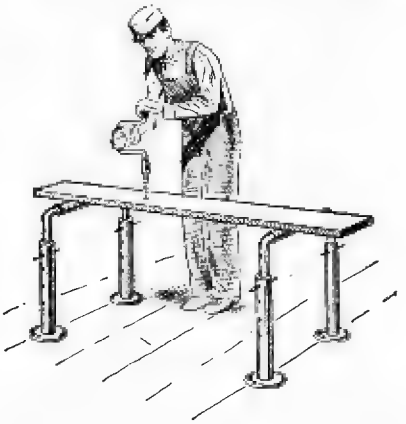
Simple Automatic Switch

A CIRCUIT-BREAKER and an automatic switch which prevent telegraph messages from being interrupted by anything happening to the current supplying the telegraphic circuit has recently been invented. The device consists of a single-pole, double-throw knife switch, held upright by an electro magnet, which receives its charge from the power circuit. A weight attached to the handle of the switch causes it to drop instantly, whenever the magnet ceases to operate.—*Orin E. Paul.*



Double-throw knife switch used as circuit breaker shown to left.

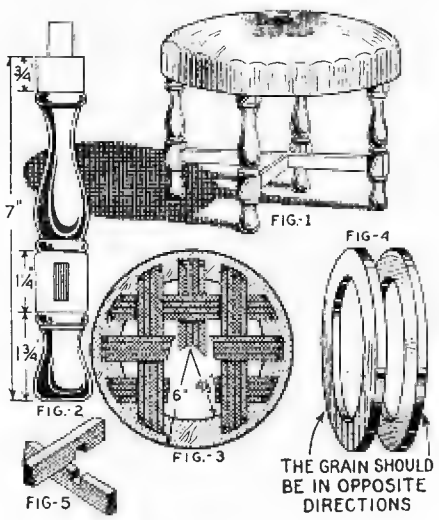
Handy Adjustable Horse



THIS horse is made of iron pipes, connected together with elbows. A smaller pipe fits into a larger pipe, which has holes bored in it an inch apart, through which a pin can be passed to keep the smaller pipe from going all the way down.—*C. W. Way.*

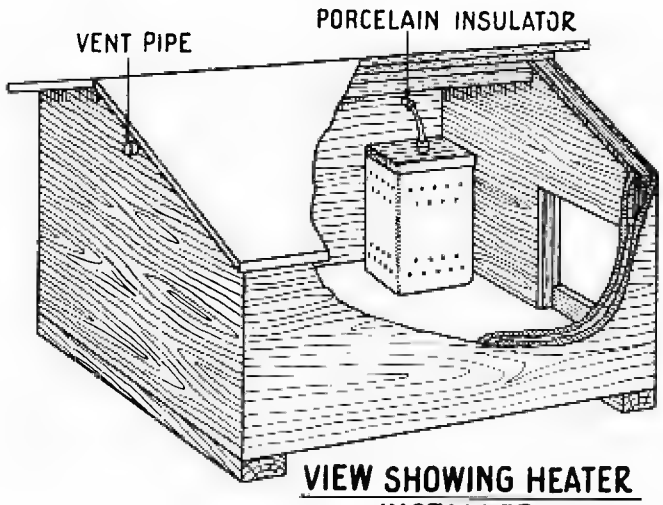
Circular Footstool

IN this footstool the circular top may be one solid piece, or a framework may be built up and webbed to carry the stuffing. If the top is to be solid, it should be 1 ft. diameter by 1 in. thick, strengthened with a batten on the underside. If it is to be a built-up frame, two circular rings should be cut from ½-in. or ¾-in. timber, as at Figs. 3 and 4, and screwed together, with the grain running in opposite directions. The legs are turned from 1-in. timber, as Fig. 2 (or may be purchased), and dowelled into the top. The cross-rails are 11½ in. long by ¾ in. wide by ½ in. thick, half-lapped together (Fig. 5), and tenoned into the legs. (See Figs. 2 to 5.) A framed top should be webbed (Fig. 3), lightly stuffed and finished with gimp.—*J. E. Lovett.*

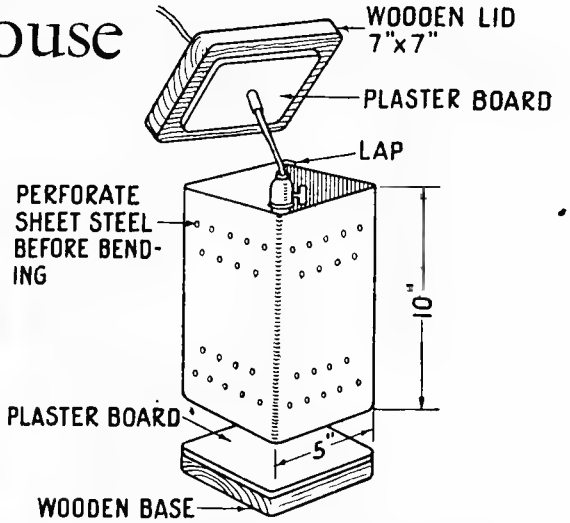


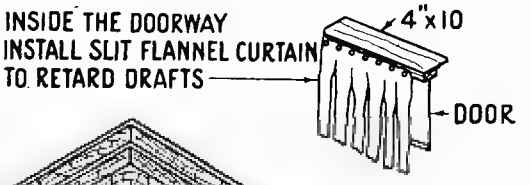
How to Heat a Dog House

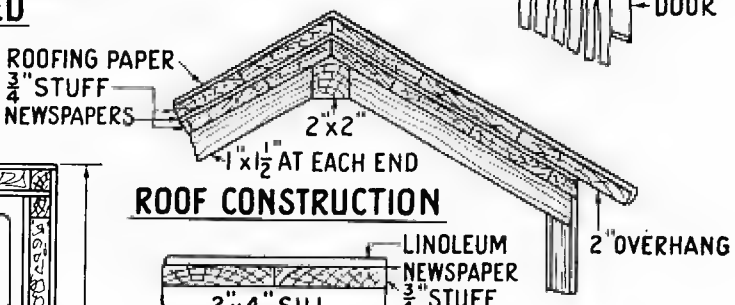
By Hi Sibley



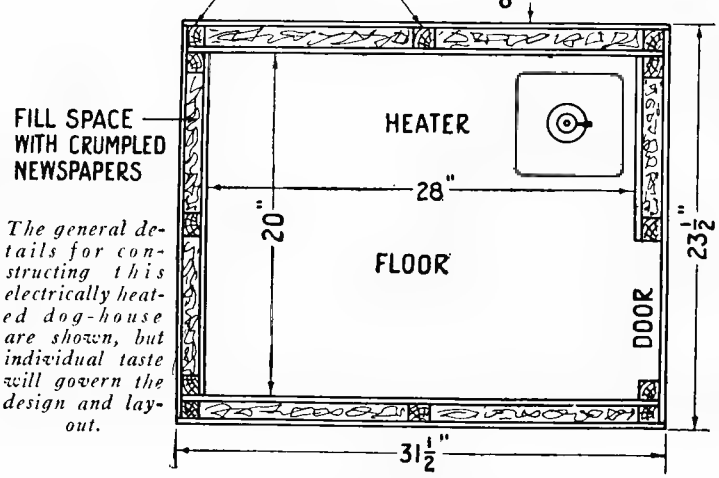
VIEW SHOWING HEATER INSTALLED



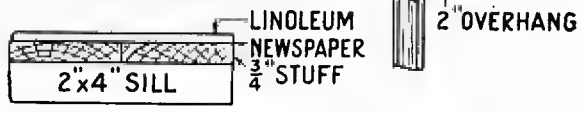




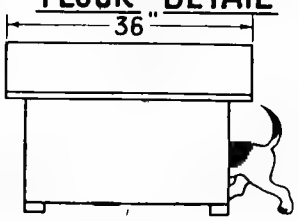
ROOF CONSTRUCTION



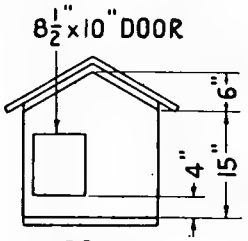
The general details for constructing this electrically heated dog-house are shown, but individual taste will govern the design and layout.



FLOOR DETAIL



SIDE



FRONT

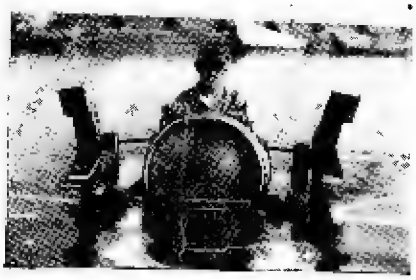
THE housing problem looms large to the city dog owner in winter. Especially so in apartment districts. Bruno generally is not wanted in the house at nights; garage fumes make him ill and often the basement is not available. These same obstacles frequently exist in the suburbs as well. However, with a back porch—be it ever so small—and a light plug, your pet can be fixed up very comfortably indeed. An electric light bulb enclosed in a sheet-iron "stove" will heat this double-walled puppy bungalow to a very cozy temperature, for a normal dog at least, in the most severe winter weather. Ventilation is provided for.

Care should be taken in constructing this house to insulate the walls well, so that the heat will be retained and cold drafts will be kept out. If this house is to be exposed to rain and snow, it is well to select lighting cord with waterproof insulation. It is well worth the expense to use good, clear lumber for the construction of this house, since you will want a presentable job, and good lumber takes paint so much better than inferior wood. The dog house may be painted to match the house or apartment—or you might consult your dog on this point. The door is covered with a flannel or other suitable flap curtain as shown.

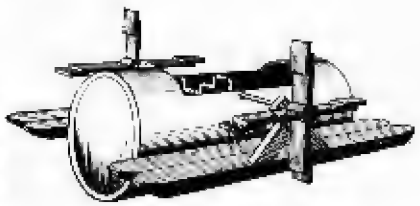
Boy's Boat Made from an Oil Barrel

A NOVEL boat (really a catamaran) may be made from a standard size oil barrel. A hole is cut just big enough for a boy to get into the barrel, which is attached to a frame work with uprights to hold the paddle wheels. These paddle wheels are made of wood and are constructed like an old mill wheel. The shafts are made of ½-inch gas pipe, with a crank bent on the inner end, and work independently of each other so that the wheels can be used for steering instead of rudder.

—*W. A. Gordon.*



A ten-year-old boy is shown seated in one of these paddle-wheel boats. They are operated by turning the cranks by hand and steered by varying the speed of the two paddle wheels.

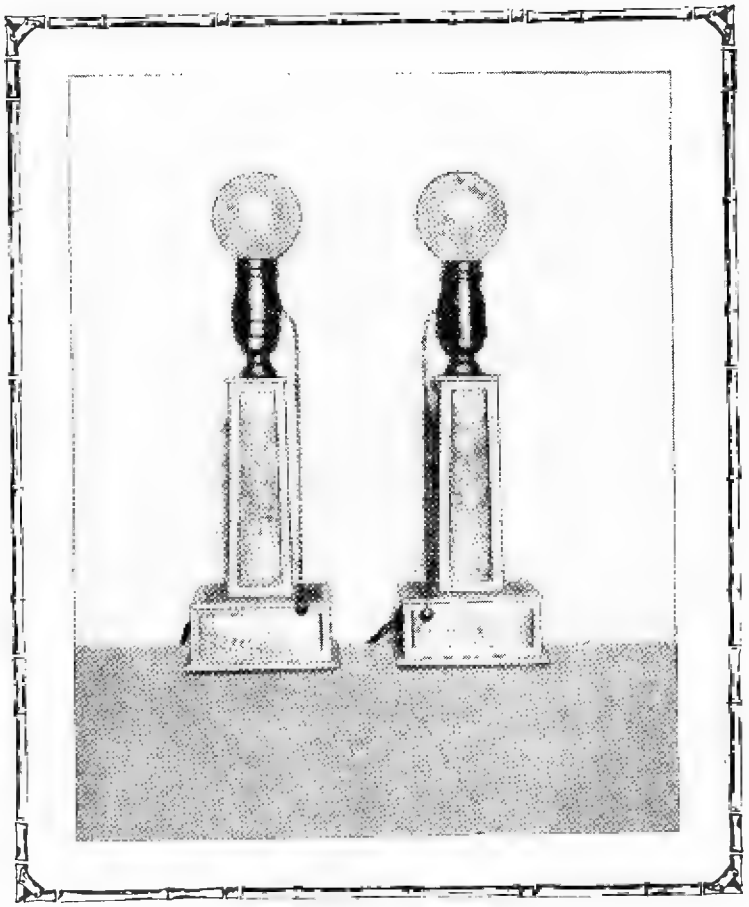


A New System of Making Distinctive Metal Boudoir Lamps

How to Make Artistic Boudoir Lamps

By C. T. Schaeffer

Many changes in design are possible, using the same method of construction



The above illustration shows two boudoir lamps made in the manner described in the accompanying article. The design is very effective, yet should it be desirable to change it for any reason, the builder will not find it at all difficult to make a different pair of lamps with the same degree of facility, using the same mode of construction. This also lends itself to building much larger products.

MANY suggestions can be offered for making lamps which are distinctive in appearance but the cost is not always within reason. The accompanying illustrations depict a boudoir lamp which is distinctive and at the same time can be made at a cost within reason.

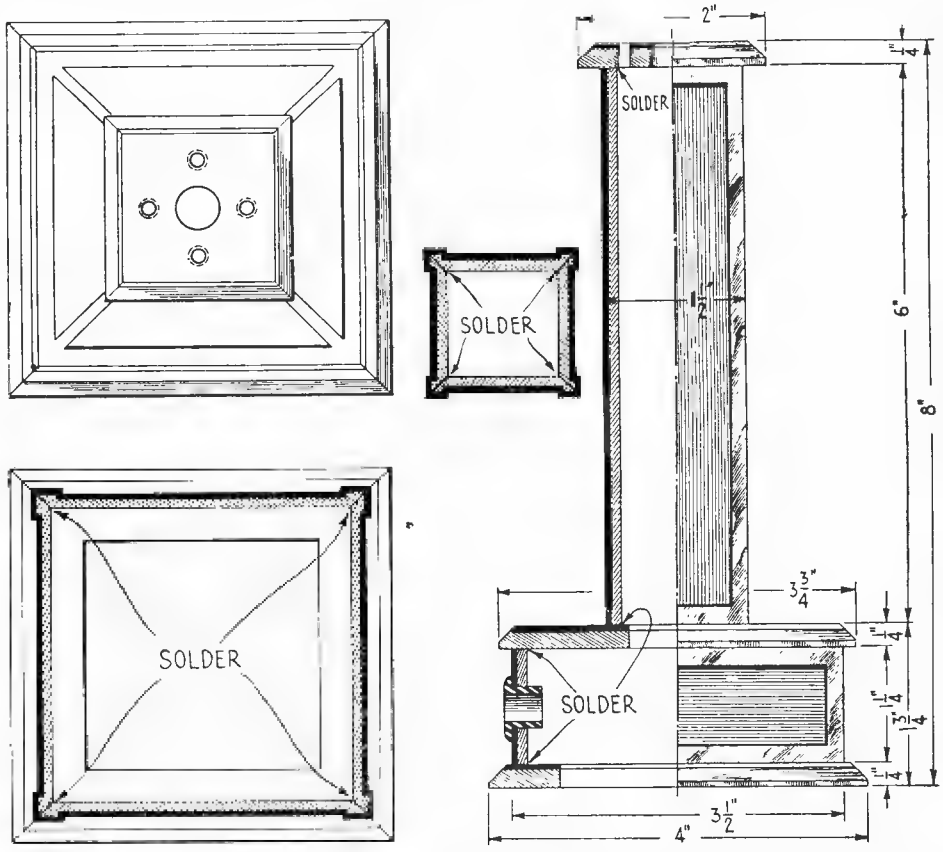
The lamp is made from electroplates soldered together, the proportions being given on the drawing which shows the details of construction and the method of assembling. The design effect for the base and the column can be developed from almost any surface that will leave an impression in wax mold. For the lamps illustrated, coarse sandpaper was used for the top of the base and the top of the column which gives a stippled or tinted effect.

For the sides of the column and the sides of the base sandpaper may also be used; however, a much better appearance is obtained by using embossed paper which has a flower design or something similar. This was used in making the lamp illustrated. However, one may also use wood carving, polychrome, coins, or, in fact, anything that has its design features raised above the background just enough to leave, as mentioned above, an impression in a wax mold.

With the design determined, the next step is to order four electrotypes of each design for the column and base for each lamp. It will require eight electrotypes for the two columns and eight for the two bases and also two electrotypes of each for the top of the column, top of the base and bottom of the base for the two lamps. These electrotypes are thin shells of copper backed up with a white metal similar to lead but somewhat harder. These copper shells can be secured from any electrotype foundry.

The edges of the electrotypes forming the joints of the column and base should be mitered and fitted carefully so as to form a good joint. One side of the base should be drilled to take a rubber ferrule which will serve as an insulator for the wire and to prevent chafing of the insulation of the wire. With the parts properly fitted they are then soldered from the inside as

(Continued on page 959)



This illustration gives all of the dimensions for the making of metallic boudoir lamps. No decorative design is here indicated, it being left to the reader's choice. The entire device is made of electrotypes, which any electrotype foundry will make at a nominal cost. This metal can be plated or can be given a polychrome finish, or even painted or oxidized.

First Prize, $5.00

Efficient Dirt Catcher

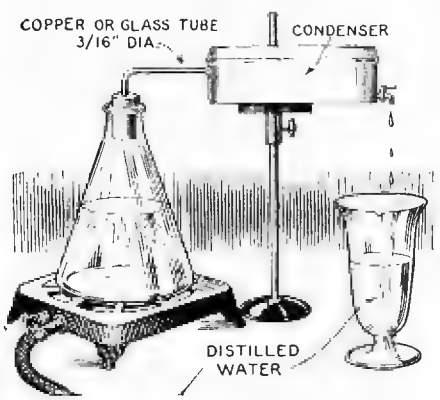
WHEN one finds it necessary to bore through a ceiling for the installation of a chandelier or for the placement of a gas fixture, much of the débris can be prevented from falling on the floor or on objects in the room if an umbrella is suspended in the manner shown. The thumb tacks holding the cord leave but tiny holes which are later covered by the canopy.—*L. F. Carpenter*

Screening Furnace Register

IN many cases trouble is experienced when customers knock small bits of paper, peanut shells and even coins down the furnace register. To alleviate the difficulty, remove the grill, cover the underside with fly screening and wire it to the grill.—*A. C. Wilson.*

Water-Distilling Apparatus

A METAL can formed as shown makes a good condenser for distilling water. The can is 8 inches long, 4 inches wide, and 3 inches deep. Note drain cock.—*Frank R. Moore.*



Cleaning Auto Radiators

A RADIATOR of an automobile may be cleaned effectively and quickly by draining the water out until there is none left in the head of the engine, pouring about half a can of concentrated lye in the radiator and running the motor until the lye boils thoroughly. The lye will remove dirt, grease, and all other substances blocking the tubes of the radiator, preventing proper circulation. The job may be done in fifteen minutes and will save the auto owner from four to six dollars by preventing the necessity for taking it to a radiator shop for cleaning.—*Vernon V. Johnson.*

Wrinkles

(Do not use in aluminum radiators and drain and flush with clear water several times.—Editor.)

Cement "Paint"

DINGY cement porches, cement block foundations and the like may be spruced up inexpensively by painting them with neat* cement mixed to the consistency of cream. Of course, this is not a permanent job, but it wears well for a season. Soak the blocks thoroughly with water before applying the "paint." Apply with a small whitewash brush. You will be satisfied with the results.—*Bjorn Winger.*

*Pure cement, no sand.

An Easy Way to Paint Screens

THE more or less tedious process of painting screens in the spring or fall may be made easier with the help of a hand sprayer such as is used for spraying shrubbery. Screen enamel is thin and works readily in the sprayer. If, however, the paint becomes too thick it may be reduced to the proper consistency with turpentine. I piled my screens up, so that whatever paint sifted through the screen meshes would not be wasted. I found that this method not only works well, but is infinitely quicker.

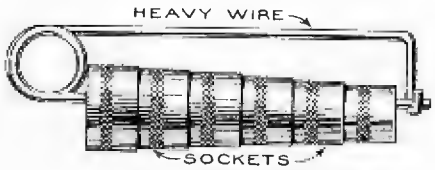
An acquaintance of mine using this method did a very creditable job on his Ford, the secret being to spray horizontally from the upper edge down, thus eliminating patchy work. A good grade of enamel, thinned somewhat but surprisingly little, was used. Of course, one must be careful to cover all parts not intended to be sprayed. Also clean the sprayer with turpentine or gasoline if you intend to use it again.—*Bjorn Winger.*

Making the "Best" Putty

VERY good putty, the life of which is many times greater than ordinary putty, can be made in this manner. Mix equal parts of ground whiting and white lead with sufficient linseed oil to make

(*Continued center column opposite page*)

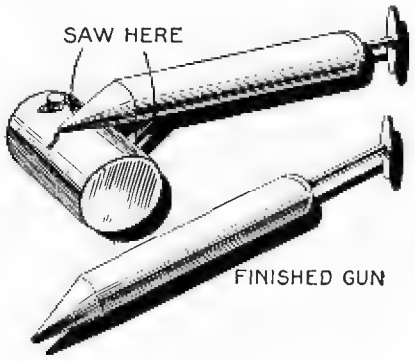
Socket Wrench Holder



THE sockets of a socket wrench are not so easily lost if they are mounted on an improvised safety pin made of heavy wire and fashioned in the manner indicated in the diagram above. The size of this can be varied to suit the sockets.

Handy Grease Gun

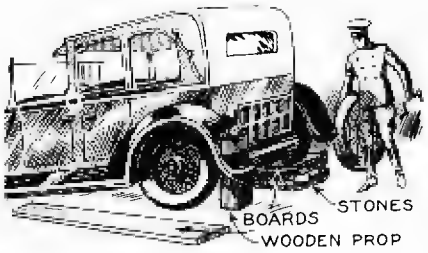
A GREASE GUN can be quickly and simply made from an old insecticide sprayer. Merely separate the reservoir from the gun by sawing it free, or use a hot iron to melt the solder, being careful not to spoil the gun. For use, remove the plug at the opposite end, fill with grease and then press on the handle to force the grease into the transmission or differential of your automobile.—*J. E. Wilkinson.*



Useful Ammonia

AMMONIA will loosen pliers that have been made stiff by rust and dirt. Just dip them in the solution. This same product makes a good paint remover. It can be used effectively to remove paint from metal statues and other objects which are to be redecorated.—*Leslie F. Carpenter.*

Emergency Jack



SET up two boards on stones, then back the car up the incline, insert a wooden prop under the axle, then remove stones under the board on the side where tire is flat.—*F. Schmulowitz.*

(Continued from opposite page)

a thick liquid. To this add enough ordinary putty to produce a consistency similar to commercial putty.—*Willie Robert Jones.*

Hot Sand Starts Car Easily

TO facilitate starting his car winter mornings, a friend of mine had a bag made of cloth, six by eight inches, which he filled with sand. At night he lays this on top of the furnace and in the morning, shortly before he is ready to start his car, lays it over the carburetor. The sand retains the heat and makes starting easy. The sack is not so full that it is not pliable. It could be any convenient size, from six inches square up to ten or twelve inches.—*Bennett B. Smith.*

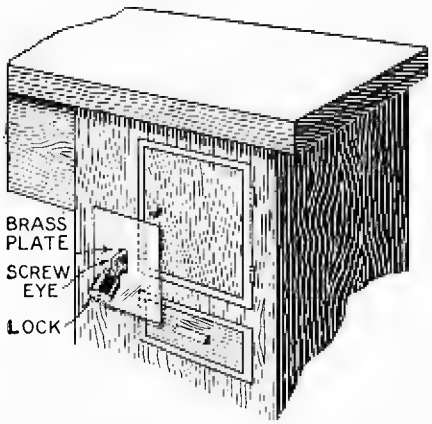
An Interesting Puzzle

THE trick lies in standing the little metal pieces on end in the bottom of a small pill bottle. The metal pieces are cut from a nail and must be short enough so they can turn crosswise in the bottle, end over end. One metal piece less than the number necessary to fill the bottle is used.—*D. Van Horn.*

and Recipes.

Locker or Drawer Lock

A SIMPLE way to make a locking device that will take care of one, two or four drawers, or one, two or four lockers, if they are arranged in two rows and two deep, is to fasten a screw-eye to the desk or closet, then make a



metal plate so that it overlaps the edges of the drawers and secure with an ordinary lock. It would be better to use a staple plate than a screw-eye, as this cannot be loosened by turning.—*Leslie F. Carpenter.*

Anti-Slip Attachments

A PIECE of ordinary rubber tubing, if slipped over the handle of a razor, prevents the razor from slipping. Covering the handle of a shaving brush with a piece cut from a long rubber balloon gives the same result with this article.

Mildew Remover

TO remove mildew from clothes, open a can of tomatoes and soak the mildewed parts. The mildew will disappear like magic.—*Eva L. Dunbar.*

To Obtain a Bright Finish on Brass and Copper

WHEN cleaning articles of brass or copper on an electric buffer, if they are first washed with gasoline and then applied to the buffer instantly after they are washed, a brighter finish will be obtained.—*Frank Zimmermann.*

Corrosion-Proofing Lead Pipes

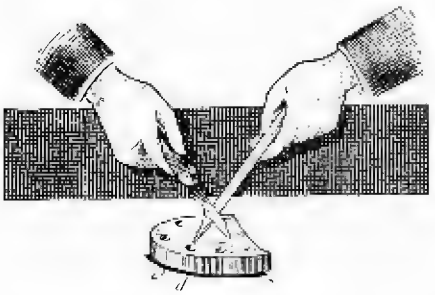
DUE to the corrosive action of minerals and oxygen dissolved in water, it is often found that the interiors of lead pipes become damaged and in some cases the pipe is ruined. When water delivered by such a lead pipe is used for drinking, there is considerable danger.

The insides of lead pipes can be treated in the following manner to avoid corrosion. The pipe is filled with a strong solution of sodium sulphide, which is drained and rinsed out after a half hour. This coats the pipe inside with lead sulphide, which is entirely insoluble, and therefore acts as a preservative.—*Kenneth Bronaldo Murray.*

$5.00

will be paid each month for the best wrinkle or recipe submitted to the editors and which they accept and publish in these columns. All other ideas accepted and published in this department will be paid for at regular rates. Address your ideas to—*Editor Wrinkles and Recipes.*

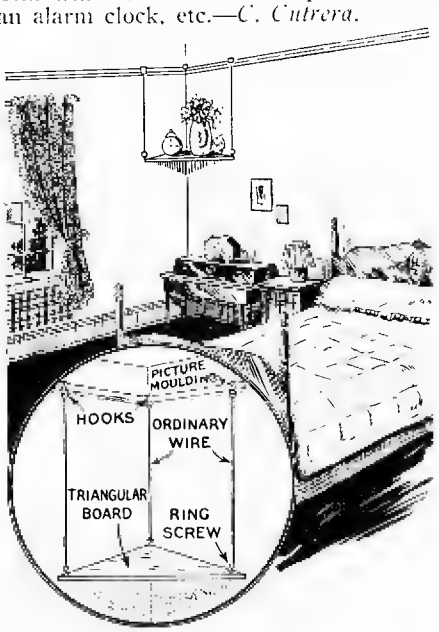
Saving Knife and Stake Point



NAILING an old rubber heel to the work-bench will save the point of a stake from being broken and also preserve the knife edge.—*Hal Kramer.*

Movable Shelf

A TRIANGULAR piece of wood can be hung in the corner of a room from the picture molding of that room if the arrangement indicated is followed. This will make a convenient position for an alarm clock, etc.—*C. Cutrera.*



THE SAFETY

Readers' Opinions and Comments

Condones Quackery

Editor, SCIENCE AND INVENTION:

Referring to the article "Anti This and That" in your December number, I wish to state that I have often thought along the same lines as Mr. Bernard. Your eternal harping and bluffing of "exposing" frauds sounds like a fraud, indeed. How come that you are so absolutely sure of all things. If you were the psychologist that you like to impress your readers that you are, you

should understand and realize that many people are benefited and helped by these so-called "fakes." Don't you know that the so-called legitimate and recognized medical practice uses all sorts of humbugs on the public; that more than 90 per cent. of benefits derived from drugs does not come from the drug itself, but from the faith in the physician.

Certainly, the "Ionaco," for example, was in itself worthless. But, in spite of this I observed dozens of cures from its application. Having handled and treated sick people for a long time, I understand fully why such things happen, but you do not seem to be able to realize anything that takes place outside of laboratory rules. Why not start a campaign against the pilgrimage of sick and crippled people to the priest's grave in Massachusetts? Who started that racket and who makes the money from it? Be sure some one does. Why not get out your reward box (it is a joke), and the "investigation committee" of mossbacks, and find out something about it. Just as much reason to do this as to heckle on some fool spiritualists. By the way, the spiritualists also perform healings by the aid of the "spirits," and they do not need to be dead for sixty years to be able to do it.

Partly familiar with a few facts discovered by science, you step out and proclaim to know all the secrets of Nature, and anything not corresponding to the dot with your preconceived conclusions, is fraudulent. They speak of boys like you somewhere in the Bible. It is easy to sense that you are not sincere, but just like to fill up space and furnish half-truth reading for immature college boys.

I do not belong to any cult or any other hokus pokus society, but I have sense enough to realize that on the whole, there is good and value for someone in any of the thousands of theories in the world. And it is not proper for me to proclaim anything that benefits some one physically, mentally, or spiritually, as a fake. A good deal of your scientific stuff is just as ridiculous as some of the "fakes."

C. SODERSTROM,
San Francisco, Cal.

(Inasmuch as you have handled and treated sick people for a long time, would you consider that your action is short of criminal if a child three or four years old came to you with a marked case of diphtheria, and you administered any of the quack remedies that are supposedly specific for this condition? Even assume that previous cases have been cured by nothing more than mirest suggestion, if but one individual died while under your care and you did not do everything that science could possibly do in a case of this sort, then you yourself deserve to be punished.

We know that many cases have been treated by what can be classed as "faith cures." Any individual who can be mentally influenced by such a set of conditions, either never had a disease in the first place, or else will soon go back to the original condition again. Nature itself has a great healing power, and ease of mind is an adjunct quite necessary to clearing up a physical condition, but this does not give manufacturers the license to assume scientific reasoning for worthless pieces of junk. Why ascribe the ability of a piece of gas pipe filled with coke dust to extract oxygen from water and feed it to the tissues?

Let us refer you to the following letter which came in in the same mail.—EDITOR):

Another Anti

Editor, SCIENCE AND INVENTION:

Under the title of "What Our Readers Think," Mr. Bernard of Royersford, Pa., has gone to great length in telling us that he thinks it is perfectly all right for a

racketeer to separate some unsuspecting individual of his, or her, hard-earned cash. I wonder if Mr. Bernard realizes that he is supporting the actions of confidence men and all other flim-flammers under fancy names?

I wonder if he also realizes that the money spent for those fool devices which have been exposed by SCIENCE AND INVENTION in some cases totaled fifty dollars per individual. Just think of the sound medical advice and treatment that can be bought for fifty dollars!

Science, to my mind, in all its branches is the most interesting subject in the world, not only because so much has already been discovered by scientists which has been beneficial to mankind, but because there is yet so much to discover. The realm of possibility is so large as to be almost inconceivable.

The money which would ordinarily be spent for "Cure-Alls," if given to research laboratories could be put to use whereby all mankind could be benefited, even you of the intellect, Mr. Bernard.

I wonder if Mr. Bernard has ever thought that scientific research is just one exposé after another? Why have the treatments, medicines and theories of the middle ages and even some in the present day, been discarded? Because they were either superseded by better ones, replaced by others more beneficial, or else truths were discovered which overthrew the theories. SCIENCE AND INVENTION has the right idea. It presents to the layman, in his own language, things which he would never be able to otherwise understand. It is constantly warning us of the laity (of course those of the intellect do not need warning) of the thousands of pitfalls into which we could blindly stumble; it is ever on the lookout for things or ideas which could benefit us, not only in our homes, but in our shops, our offices and even on the street.

Is this your idea of narrow-mindedness, Mr. Bernard? Thank Heaven those people who are of Mr. Bernard's opinion are in the minority, or I guess we would all be reading Grimm's Fairy Tales, instead of SCIENCE AND INVENTION. Go ahead with your exposés, Mr. Editor, and let's have some more articles on undersea activity, nice *long* ones.

I hope you discover something fraudulent and expose it in your next issue, just to spite Mr. Bernard.

NICOLA G. D'ASCENZO,
Philadelphia, Pa.

(It is evident from this communication that the exposé articles appearing in SCIENCE AND INVENTION Magazine have been of benefit to some individuals. If they have helped in but one single case; if they have been of benefit to only one individual; if they have been the means of preventing but one person from being fleeced out of his hard-earned cash—we feel that the time and effort devoted to the subject have been well repaid —EDITOR.)

A Misleading Ad?

Editor, SCIENCE AND INVENTION:

Knowing your desire to eliminate all advertising that is or seems to be misleading, I would like to invite your attention to an "ad" on page 544, SCIENCE AND INVENTION for October, 1929. The "ad" in question offers a blank automatic pistol and 100 cartridges for $4.85.

In large letters it states "No permit or license required."

Does it seem possible that the advertiser, a New York City concern, never heard of the famous Sullivan Law?

Dotted lines indicate manner in which blank cartridges are fired upward and at an angle.

VALVE

Will Be Welcomed by the Editors

I had occasion to be in court the other day when a young man was arraigned on a charge of unlawful possession of a firearm. He pleaded guilty in the Magistrates' Court, but said that he bought the gun from a Mail Order House, which advertised in a magazine that no permit or license was required.

Because this youth had a previous conviction for petty larceny, the charge of carrying a weapon became a felony, and in the language of the magistrate he was "held without bail to await the action of the Grand Jury."

This man faces five years in State Prison. I know that in Texas and some other states one may have a pistol on their ranch or farm, but see what section 1897, of the penal law of New York has to say. See how many have been convicted of a crime for possessing blank cartridge pistols. I feel that you will then censor such "ads" in your publications.

CHRISTOPHER E. MONAGHAN.
Bronx, New York.

(Evidently, the writer of the above letter refers to the case known as "People vs. Thompson," where the identical gun here illustrated was brought before the Court. In the case of "People vs. Thompson," the defendant was arrested and charged with having in his possession one of these so-called automatic guns. He was held by the Magistrate for Special Sessions and later convicted and sentenced to the Penitentiary.

Previous to this matter, the corporation that manufactures and sells these automatic pistols was arraigned before Magistrate Simpson of the Magistrates' Court, charged with violation of Section 1914 of the penal law, which prohibits the sale of firearms. In that case, which was intended primarily as a test, Judge Simpson held that the article was *not* a firearm.

Thompson, after being sentenced to the Penitentiary, communicated with the Legal Aid Society, and Associate Counsel Edward T. Tighe, of that organization, applied to Justice Ford in the Supreme Court for a certificate of reasonable doubt, and questioned whether or not the gun was in reality a firearm, as described in Section 1914 of the penal law.

Justice Ford granted the certificate of reasonable doubt and admitted the defendant to bail pending appeal.

On October 26, 1929, the Appellate Division in "People vs. Thompson" handed down a decision as follows: "Judgment reversed and information dismissed, upon the ground *that the instrument in question does not come within the prohibition of the statute, it being neither a firearm nor a dangerous weapon.*"

It therefore clearly indicates from the above decision that no permit or license is required and that the advertisement appearing in SCIENCE AND INVENTION Magazine is neither untruthful, nor is it an advertisement which is misleading.—EDITOR.)

Still Larger Leaves

Editor, SCIENCE AND INVENTION:

I notice in your magazine a picture of an elephant ear, and inasmuch as I had one larger, I am sending you a photograph of the same. This bulb was planted about one year ago and the base of it now is 17 inches in diameter. The lady you see holding the yardstick is 5 ft. 9 inches tall. As you will notice these leaves exceed Mrs. Cason Walker's. The one I am sending you a photo of is 53 inches long and 34 inches wide.

W. A. MCLEOD,
Milton, Fla.

(Well, well—we didn't know that any larger "elephant ears" existed. However,

there may be someone who lays a claim to still a larger ear than the one entered by the County Judge of Santa Rosa County in Florida.—so come along you growers of large ears—pardon us, we should have said large elephant ears. Can you break this record?—EDITOR.)

More Spirit Exposés

Editor, SCIENCE AND INVENTION:

Allow me to voice my interest and approval of the article "Mediumship—The Science of Invented Hokum," by Mr. Wagner, in your November issue.

You are doing a great good to the public who have been deceived long enough by the fakes.

I should like to see more of Mr. Wagner's experiences printed—for one who is as brave as he evidently is must have plenty to tell.

H. O. PFEIFFER,
St. Louis, Mo.

(At least, Mr. Pfeiffer, you are in the great majority. More than 90 per cent of our readers believe that we are doing good by our exposé articles. Less than two per cent. feel that the public really should be fooled, if "They are stupid enough to fall for the propaganda which is being disseminated by the clans of fraudulent medical treating devices and other nefarious schemes." There may be some logic to this form of reasoning. Perhaps those that are once bitten are twice shy. However, our situation is that there is no necessity for the first bite. If a man is interested enough in knowing the facts, he should be able to get them. We still hold that it is perfectly righteous for any organization to disclose the lies in propaganda and we will continue to hold this viewpoint, until such time as we are convinced contrariwise.—EDITOR.)

"An Intricate Problem?"

Editor, SCIENCE AND INVENTION:

The Saugus *Herald*, of which I am the editor, recently asked a question, the reward being, for the nearest correct answer, a year's subscription.

Unfortunately, my question was laid aside for weeks and the article appeared a long time after SCIENCE AND INVENTION had asked and answered the same question.

The question was in substance this: If the circumference of the earth at the equator is 25,000 miles, how much extra wire would be required if a line is erected six feet from the surface of the earth at the equator? I specified that there must be no sag and that all fractions must be discarded. I desired flat figures only.

To my surprise I received many replies, ranging from 6 feet of new wire up to very many miles. I believe the correct answer was 36 feet, after discarding fractions, but two men have given me the answer as follows, i. e., 37.6992 feet and 37.69911180 feet.

Can you give me the correct answer, giving the reason why?

I had your publication in the office, but somebody stole or appropriated it. I find that same trouble occurs when I leave one of your publications about, which is a compliment to you, but is rather tough on me when I try to refer to them for the answer to any intricate problem.

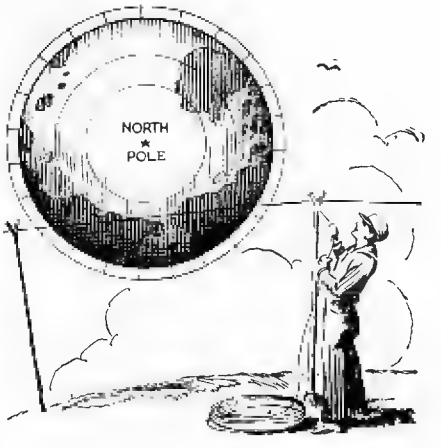
By the way, my daughter and wife, who formerly turned up their noses at your publication, today grab off the copies so that I find it hard to get hold of them. Your placing of science in popular form has done wonderful things. I am actually proud of the fact that I have never missed a copy of SCIENCE AND INVENTION since it changed its name and I was a reader from the inception of the "Electrical Experimenter."

ARTHUR E. STARKEY,
Saugus, Mass.

(The circumference of a circle is π d. We must therefore first find the diameter of a circle whose circumference is 25,000 miles. In order to assure accuracy it is better to convert the 25,000 miles into feet than it is to convert the twelve feet to be added to the new diameter into a fraction of a mile. Therefore, multiplying 25,000 by 5,280 we get 132,000,000.

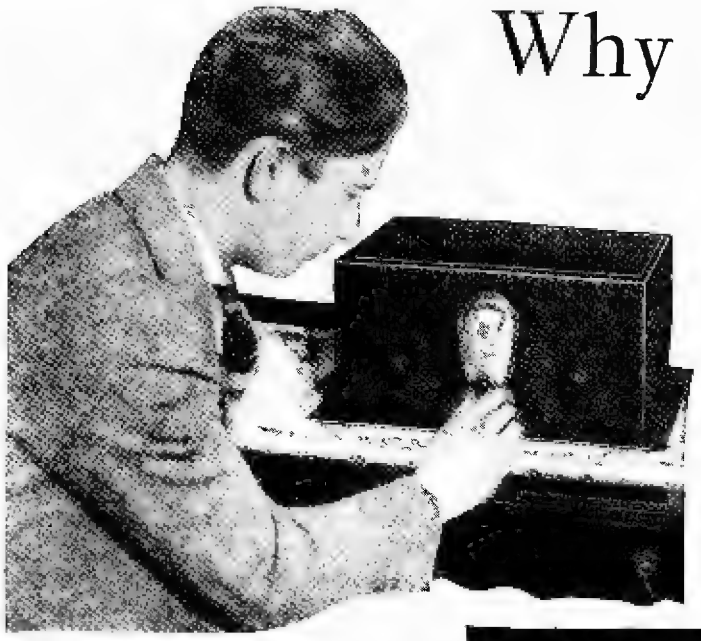
Because the circumference of a circle is 3.14159 times the diameter, we divide this

(*Continued on page* 947)

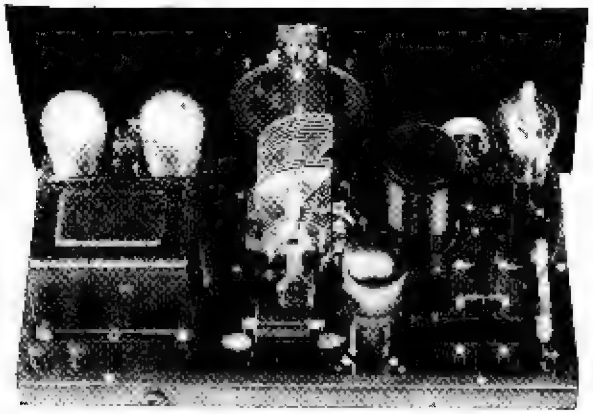


Why I Am Interested in SHORT-WAVE RECEIVERS

By George R. Brown



Here we see Mr. Brown, the thrill-hunting author of this article pictured at the dial of his "National Thrill Box" on the trail of a short wave. To the right, the chassis of the "National Thrill Box"

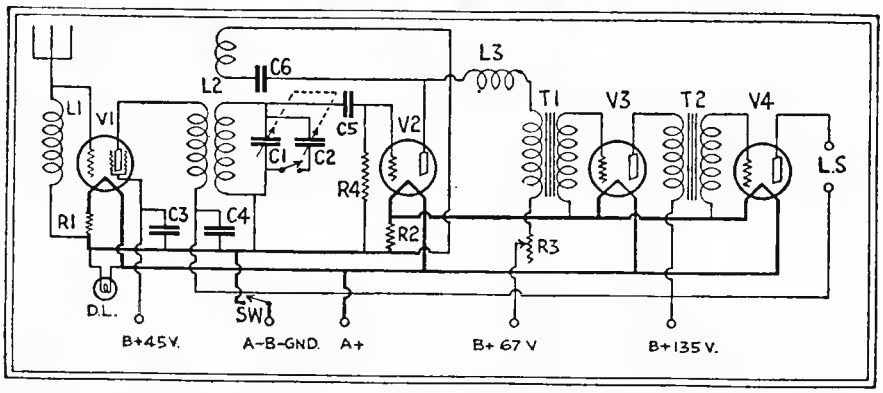


IN which a "DX" hound writes of the virtues of radio's latest favored child—the Short-Wave receiver. If you are looking for thrills, here's your chance.

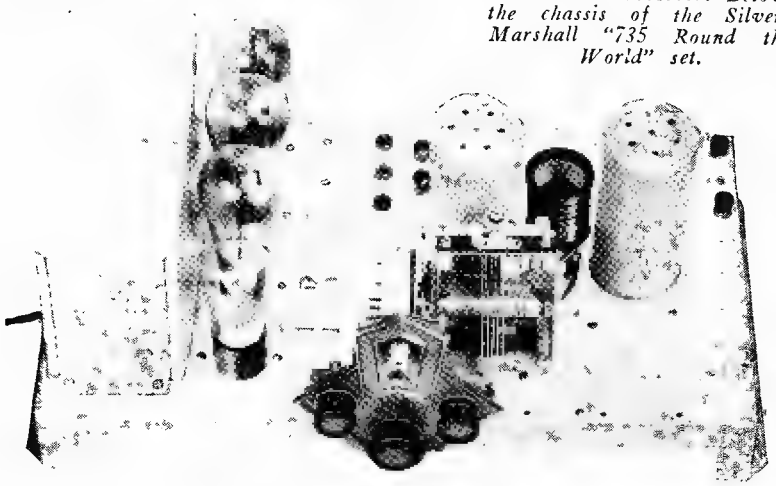
SEVERAL weeks ago I was sitting in my room at home in front of a *short-wave* receiver. I had a pair of earphones clamped on my head, and was in the midst of concentrating on some close tuning. A friend of mine burst in upon me, stood watching me with a rather sarcastic expression on his face, and on hearing a long, drawn-out squeal from the loud-speaker, threw up his hands in disgust and fled from the room. After tuning in a station, which, incidentally happened to be G5SW, Chelmsford, England, I walked into the living-room to find my friend prodigiously reading a rather interesting tabloid newspaper.

"I'll be darned if I can see what interest you can find in that dinky old set," he said to me rather disdainfully. "All you seem to get is squeals and oscillations on it. Just why are you interested in short-wave sets?"

"Why do you read that tabloid so much," I countered. "Because it's interesting, because it's racy and unusual; that's why you prefer it to a more staid daily. Well, that's one reason why I prefer the short-waves to the regular broadcast band. Every night when I turn on my broadcast band receiver I know I'm going to get certain fixed programs—several jazz-bands, a playlet, and perhaps a symphony orchestra if I'm lucky. Now, when I turn on my short-wave receiver, I don't know what to expect. I may hear the cultured voice of the English announcer of G5SW, or I may hear the guttural tone of PCJ, Eindhoven, or I may hear the lyrical sing-song of JOAK, Tokio, Japan. At least I'm sure of variety, and you know the famous adage about *variety being the spice of life!* There's a certain indescribable thrill in pulling in those distant stations, which one does not experience until he's played around with the dial for some time and has gotten nothing but New York or Chicago. Come on in and listen to that set—England on the loudspeaker!



Above, the wiring diagram of the National receiver. Below, the chassis of the Silver-Marshall "735 Round the World" set.



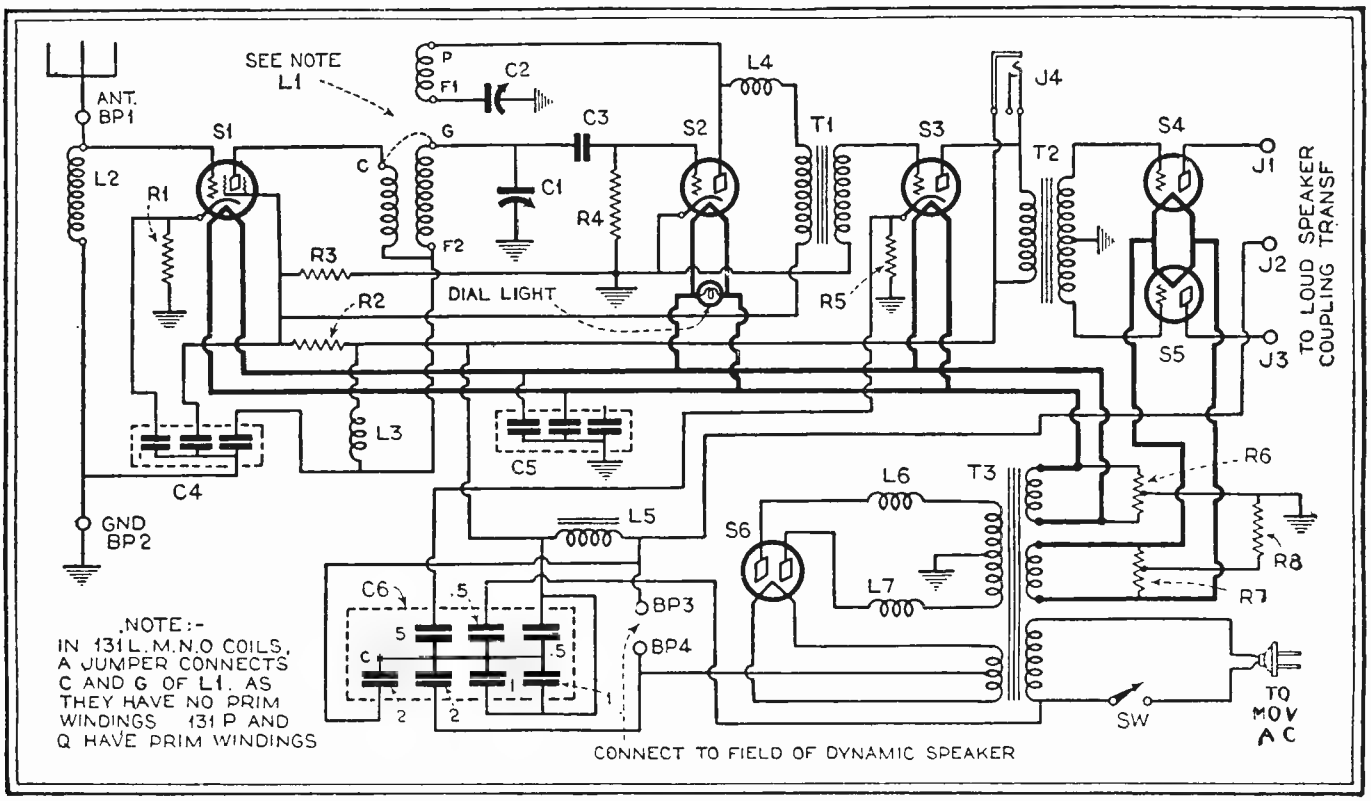
Well the outcome of that little meeting and

discussion was that my friend soon became a short-wave enthusiast. The other night I dropped into his house, and, believe it or not, he was seated in front of his set most zealously tuning in. It was my turn to smile in superior fashion.

One of the ways I overcame his opposition was to show him the simplicity of the short-wave circuits, and the modest cost of these sets. I thought some of the readers of SCIENCE AND INVENTION might be interested in seeing two of the best and most successful of these circuits. One of them is the "National SW4 Thrill Box," and the other is the Silver-Marshall "735 Round the World." The Silver-Marshall set may be operated directly from the electric-light socket, while the National set is designed for battery operation. The National set features a screen grid tube in an untuned radio stage followed by a regenerative detector and two stages of audio amplification. The audio unit is unique, containing two transformers in one case. Parallel feed through a resistance couples the plate circuit of the detector (the regenerative feed-back of which is controlled by a variable resistance) and the first audio tubes to the succeeding stages, each going into an auto transformer-connected coil, giving a five to one step-up. This type of amplifier has another advantage: it permits the use of a high-mu tube in the first stage, working at its maximum efficiency. Thus we have an audio gain of two 5 to 1 transformers, plus a first stage radio giving an amplification of from 25 to 30. This insures plenty of pep and quality for any signal impressed on the detector of the set. My friend and I found the set very easy to construct as it came in kit form, and I think you will, too. Below is a list of the parts used:

The Silver-Marshall is a very stable set, which we have also tried on the short-waves. It operates directly from the light socket, and has its power-pack built as an integral part of the set inside of the cabinet. The receiver uses a choke-coupled, screen-grid stage, followed by a *227* detector, a *227* first stage audio, and a pair of *245* tubes arranged in push-pull. An inspection of the schematic wiring diagram does not disclose any unusual circuit arrangement. With the exception of the two chokes, which are in series with the plates of the *280* rectifier tube, the by-pass condensers from the heater circuit to ground and .1mfd condenser, which is connected into one side of the line, the circuit is quite conventional. However, the regeneration is controlled by a variable condenser, instead of the variable resistance as in the National short-wave receiver.

In concluding this article it might be well to say that both of these short-wave receivers are equipped with sets of coils, which permit the receiver to be used on the regular broadcast band as well as on the short-waves. I think you'll find a lot of fun in the building and operating of either of these sets. Complete instructions accompany the sets of parts.



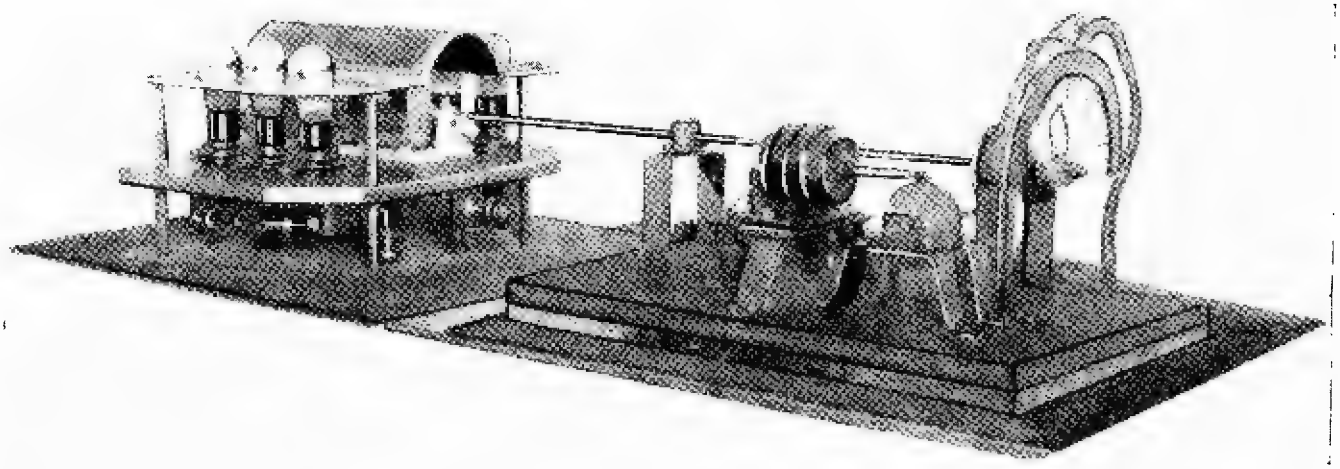
Above is the wiring diagram of the Silver-Marshall receiver. The note in the lower left-hand corner refers to the removable coils for broadcast band reception. The list of parts referring to this diagram will be found below.

SILVER-MARSHALL
Component Parts for
735 (a.c.) Round-the-World Receiver

Designation	Quantity	Description
C1	1	S-M 314 .00014 mfd variable condenser.
C2	1	S-M 342B .000075 mfd midget condenser.
L1	4	S-M plug-in coils, 131L, 131M, 131N, 131O.
L2, L3, L4	3	S-M 277 short-wave r.f. chokes.
L6, L7	2	S-M 275 r.f. chokes.
L5	1	S-M 338 filter choke.
T1	1	S-M 260S audio transformer.
T2	1	S-M 270U push-pull input transformer.
T3	1	S-M 336U power transformer.
	1	S-M 818 Hook-up wire.
C3	1	Polymet .00015 mfd. small moulded condenser.
C4, C5	2	Potter 30B bypass condenser banks.
C6	1	Potter 674C filter condenser block.
S1	1	C-R 224 tube socket.
S2, S3	3	C-R 227 tube socket.
S4, S5	2	C-R 245 tube socket.
S6	1	C-R 280 tube socket.
R2, R3	2	Durham 10,000 ohm 2-watt resistors (green).
R4	1	Durham 2-megohm 1-watt resistor (red).
R5	1	Durham 2000 ohm 1-watt resistor (white).
R6, R7	2	Yaxley 840C 40-ohm CT resistor.
J1, J2, J3	3	Yaxley 422 insulated tip jacks.
J4	1	Carter 2A closed circuit jack.
R1	1	Carter RU 400—400-ohm resistor.
R8	1	Ohio Carbon 800-ohm 3-watt resistor (green).
SW	1	H&H 1561 rotary on-off switch.
BP1, BP2, BP3, BP4	4	Moulded binding posts.

NATIONAL LIST OF PARTS

No. of Parts	Name of Parts
1	Foundation Unit—Consisting of a metal front and genuine Westinghouse Micarta sub-panel completely drilled and equipped with tube sockets, grid-leak mountings, etc., and metal mounting base.
1	Set of (4) transformer coils (15-115 meters).
1	Type E dial, illuminated.
1	EC4 Special variable condenser with switch.
1	SW 4 Duo Coupler.
1	No. 10 H. F. Impedance.
1	Switch with National knob.
1	15-ohm fixed resistor.
1	1-ohm fixed resistor.
1	.00025 fixed condenser.
1	.0001 fixed condenser.
1	.001 fixed condenser.
2	.5 fixed condensers.
1	3000-ohm special variable resistor with National knob.
1	6-megohm grid-leak.
3	Binding posts.
1	6-wire cable.



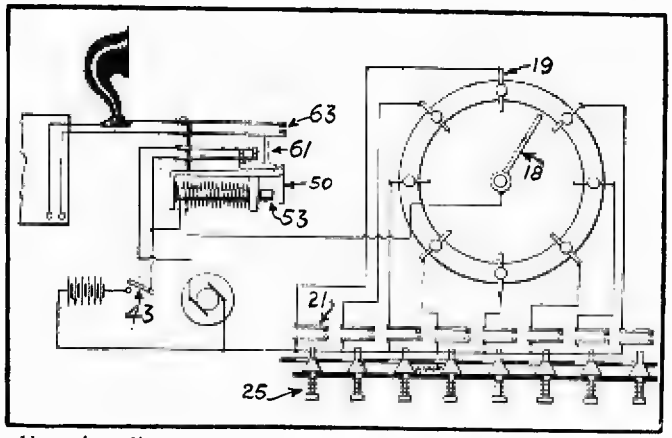
Above is a view of the author's set, with "remote control" attached. At the right of picture are the contact points, rotating switch, and motor geared to rod leading to gang condenser.

Remote Station Selector *of* Simplified Design

Utilizes One Small Motor and One Relay, Plus Selector Push Buttons

By Joseph Attardo

"REMOTE CONTROL" is the magic phrase now being uttered by any number of prominent radio manufacturers. Like the advantages of the screen-grid tube, it is a much-maligned quantity; in many cases involving the use of countless solenoids, a motor that sounds like a whirlwind, and an intricate wiring system familiar only to its creator. As far back as the days of 1926, when the tuning of a station brought in a squealing due to numerous carrier waves on the air, I had experimented with means for keeping the speaker out of action until the station I desired was tuned in. The collection of switches and gadgets necessary for this arrangement was appalling, and the result—well, I was ordered to the cellar with my latest brain child. The continual running up and down stairs to tune my set piqued me considerably, and my brain under the stress of this emotion conceived the idea of tuning the set from some remote point.



Above is a diagram of "remote control" device from the author's patent application. The figures are explained in the accompanying article.

The author is pictured at station selector panel, located in his home in New York. His finger is on the switch which controls the power for his remote control device. The 36 buttons (each selects a station) may be seen on the panel.

I bought a key with thirty-six push buttons of the type used in intercommunicating telephone systems, and mounted the panel containing the buttons in the wall flush with the surface. One of the illustrations shows this panel as it appears in my dining-room.

I will explain the operation of this set of push buttons. There are two rows of eighteen each, but any number larger or smaller could be adopted equally well. Alongside each button is a small name plate, on which the call letters of a broadcast station are printed. Over this bank of buttons is a pilot light and beneath the panel a small "on" and "off" switch. When I desire to hear a station, I first press the "on" switch. This supplies the current to the radio set located two floors below in the cellar. As the current goes on the red pilot light above the panel lights up, thus acting as a visual indicator that all is ready for tuning.

Suppose, for instance I wish to get WEAF. I press the button beside the WEAF name plate, and in a few seconds I hear that station; provided, of course, it is on the air. If I am not satisfied with the program feature, I select another station and press the corresponding button, for instance, WLW. In a few seconds I hear that station. When I am through for the evening, I press the "off" switch and the set goes dead.

Now for an explanation of the circuits that make this form of remote control possible. The mechanism consists of a distributor, a small motor, a few gears, and a set of relays. To attach the control device no changes need be made in the set itself. In fact, it is workable on any tuning chassis on the market, provided the tuning is accomplished by a single knob.

The actual mechanical operation of this remote control device is very greatly simplified by tracing a single operation by means of the diagram on this page. The on-off switch is (*Continued on page* 958)

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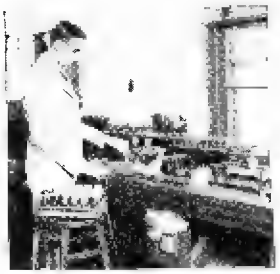

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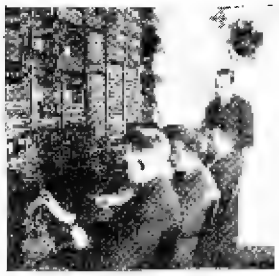

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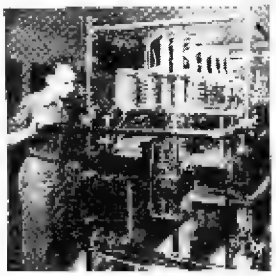

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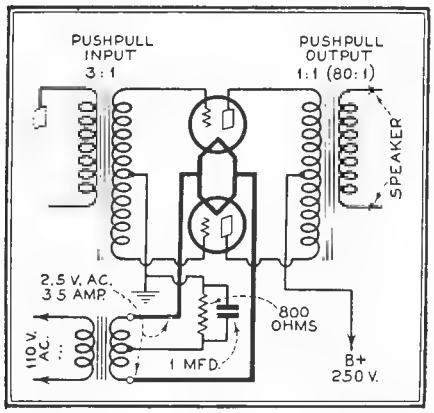
Changing to Push-Pull Audio

(743) Arthur H. Rose, Amityville, Long Island, N. Y., writes:

I have a Kolster set which utilizes a 171 tube in the last audio stage. I would like to change it to use two 245 tubes in push-pull.

A. 1. This may be very easily done. The accompanying diagram shows the hook-up for tubes in push-pull. If a magnetic speaker is to be used the output transformer should have a ratio of about one to one; if a dynamic speaker is used the ratio should be from twenty to one to eighty to one—depending on the impedance of the coil. We would like to stress the point that the quality of this audio system will depend greatly on the quality of the transformers used. One cannot expect to get beautiful tone from cheap transformers; they are not built for it.



A simple and easy way of converting the last audio stage into the popular push-pull arrangement is shown above.

Eliminating Interference

(744) James R. Jackson, Providence, R. I., writes:

Q. 1. I live in a four-family house and operate an Atwater-Kent set. Every time the door bells or an electric light is turned on, there is a crackling or snapping sound in the speaker. Can you give me any help?

A. Disconnect the antenna and ground from the set; ring the doorbell and see if the sound comes through the speaker. If it does not, try running your antenna in another direction, though it is doubtful if anything short of installing a filter at each bell will do any good. This will not stop the interference from the lights. If the noise is heard when the antenna and ground are disconnected you are picking up a line noise. This may be eliminated by installing a filter which is connected between the set and the electric outlet.

Selecting Circuits

(745) William B. Falls, Los Angeles, California, asks:

Q. 1. Which of the two following circuits will be best for distance reception and which will be clearer? (a) one employing eight tubes as follows: four tuned radio frequency, detector, rectifying tube, and two audio, using a 171 in the last stage; (b) seven tubes: three stages tuned radio frequency, rectifying tube, detector, and two audio using a 250 in the last stage.

Radio Oracle

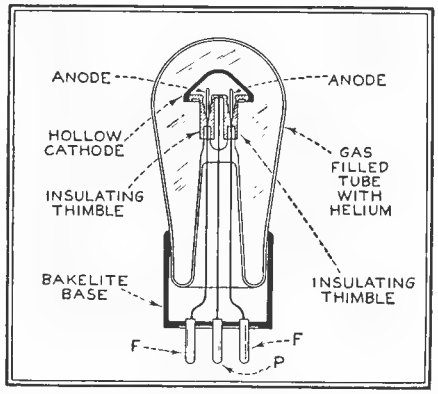
A. 1. The circuit using the four stages of t. r. f. would give better distance reception; the one using the 250 audio tube would give better tone. It would be a good idea to use a circuit employing four t. r. f. stages, detector, and two stages of audio with 245 tubes in the push-pull stage.

Gaseous Rectifier

(746) Harold J. Smith, Austin, Texas, asks:

Q. 1. Will you please explain the theory of the gaseous rectifier tube?

A. 1. The construction of the gaseous rectifier tube is shown in the accompanying diagram. The action is as follows: When potential is applied to the rectifier the gas atoms become ionized. Positively charged atoms are attracted to the cathode where they pick up negative electrons and return to the anode. They are re-ionized by collision with other atoms and now



The small anodes allow for a continuous passage of electrons to the cathode as shown in above diagram of gaseous rectifier.

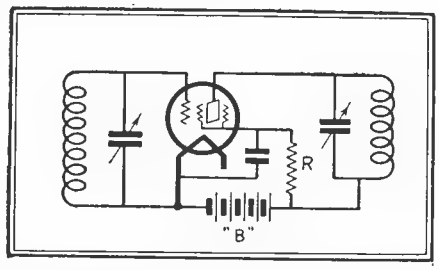
repeat the first process. Ions which are lost in this colliding process seek the positive terminal, and a flow of electrons result from the cathode to the anode. The terminals of the tube are made unequal in size, so that the flow will occur in only one direction. The method of full wave rectification is obtained by using two small anodes, which alternately pass the current.

Voltage for Screen-Grid Tubes

(747) Fred H. Millen, of Oskosh, Wisconsin, writes:

Q. 1. I intend to use a '22 type of screen-grid tube in my set. There seems to be some difficulty in obtaining the proper voltage for the screen. I would like to have a diagram showing means of obtaining this voltage.

A. 1. The accompanying illustrations show a means of connecting the screen of the tube so as to obtain the maximum efficiency and insure an almost constant ratio between the plate and the screen. The standard method has been to take off a tap, somewhere along the plate battery. This plan is very good so long as the various batteries maintain a constant terminal voltage, but this method is not efficient as the set is used and the batteries deteriorate. Although the ratio between the screen and plate voltages is not critical, the potential difference in batteries connected in series is often great enough to affect the efficiency of the tube operation. This arrangement is designed for the use of a standard metal resistor.



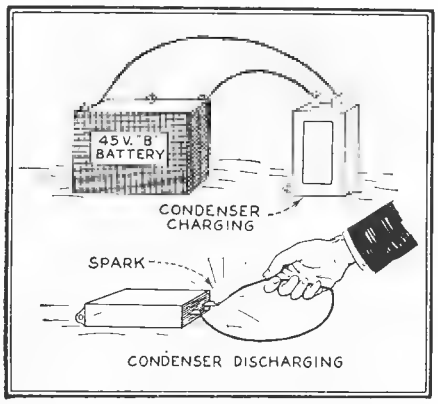
Potential for the screen-grid may be obtained easily, as shown in the above illustration.

Test for Filter Condensers

(748) James Young, Wallingford, Connecticut, writes:

Q. 1. The filter circuit of my eliminator recently broke down. I replaced all the condensers with new ones, but I am sure that all of them were not damaged. Please describe a method of determining whether or not a condenser is still usable.

A. 1. There are several ways in which a filter condenser may be tested, but probably the simplest is the discharge method. The only apparatus necessary for testing condensers this way is a "B" battery and two pieces of wire. The battery is connected to the condenser for a minute, to charge it, and then one of the wires is connected from one side of the condenser to the other side of the condenser (after the battery has been disconnected). If



An effective means for testing filter condensers may be seen above.

the condenser is in good condition a spark will jump from the condenser to the wire when the latter is brought close to the terminal of the condenser. If, after several attempts, no spark is seen, the condenser is defective.

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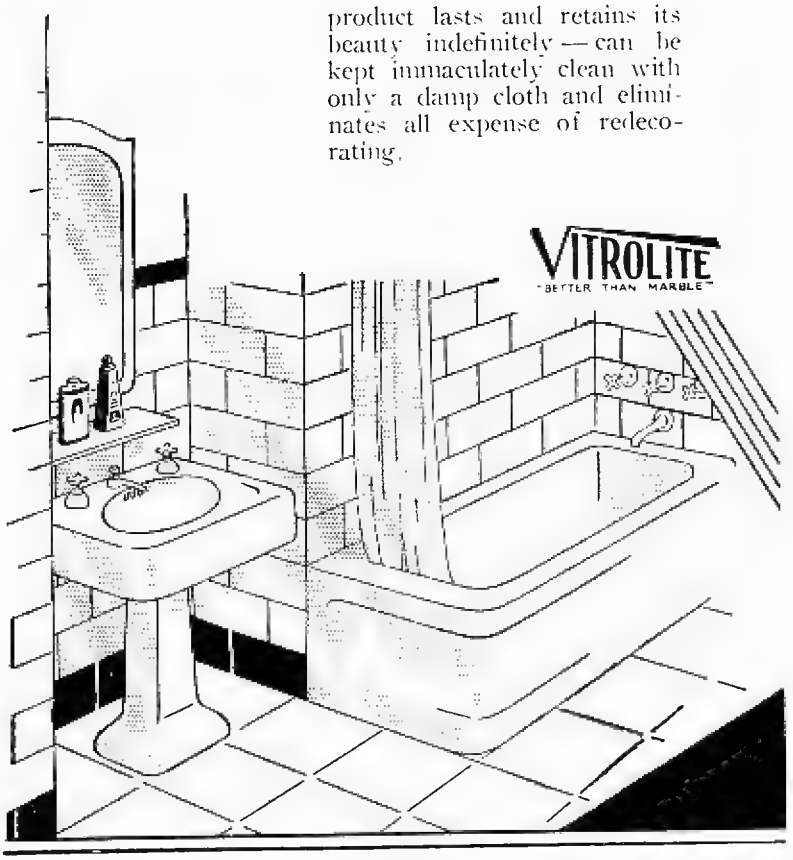

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Scientific Humor

GOING EAST, NOT WEST

An elderly lady walked into a ticket office at Chicago and asked for a ticket to New York. "Do you wish to go by Buffalo?" asked the ticket agent. "Certainly not," she replied, "By train, if you please!"

AUTOMATIC

"Fo' de land's sake, Mandy, what make you all gib dat baby a big piece of po'k to chaw on? Don't you all know de po' chile'll choke on it?"

"Dinah, can't you all see de string what's tied to dat piece o' po'k. De odder end's tied to chile's toe. Ef he choke he kick and if he kicks he'll jerk de po'k out. Ah reckon you all don' learn me nothin' 'bout bringin' up chillun."

—*David E. Keller.*

THE SENSE OF TOUCH

JANET—Jack says he can read me like a book.

OLIVE—Yes, and darn him, he wants to use the Braille system."

—*Mrs. Patterson Miller.*

AND THE WHISKEY?

FRIEND — Well, did you follow my advice and drink a stiff whiskey after a hot bath?

INVALID — I did my best, old chap, but I couldn't finish drinking the hot bath.

—*C. H. R.*

PERFECTLY STRAIGHT LINES

"According to Einstein, everything, even space, is curved."

"Nuh, he ought to see my sweetie after she got through her eighteen day diet!"

—*F. F. Marbour.*

ANTI-GRAVITATION AT LAST!

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"Gravitation," explained the Physics Instructor, "is the attraction between two bodies. When you throw yourself from an altitude, the earth rises to meet you. The same when you walk; as you raise one foot, the earth rises to meet it."

"How can it," queried a bright youth, "when you hold it down with your other foot."

—*George Perlowski.*

ALL jokes published here are paid for at a rate of $1.00 each; $3.00 is paid for the best joke submitted each month.

Write each joke on a separate sheet of paper with your name and address.

THE NOSE KNOWS

Little Betty's grandmother used the old-fashioned method for measuring a yard by stretching the goods at arms length, holding one end of it up to her nose. One day Betty came up to her grandmother with a piece of tape.

"Smell this, grandma, and see how long it is," was the startling request.

—*Elizabeth Buerman.*

EMPLACEMENT?

OFFICER TO PRIVATE—Do you know what that thing is for on the end of your gun?

PRIVATE—Yes sir, to stick an enemy so he can be still long enough for me to shoot him!

—*Eugene Little.*

IT'S A WONDER

Jimmie giggled when the teacher read the story of the man who swam across the Tiber three times before breakfast.

"You do not doubt that a trained swimmer could do that, do you?"

"No, sir," answered Jimmie, "but I wonder why he did not make it four and get back to the side on which his clothes were!"

—*Gordon Walstrom.*

SHOOT HIMSELF?

HUNTER—Dear I shot an elephant in my pajamas.

FLAPPER—My God, how did he get there?

—*Katherine M. Krohn.*

STONE AGE STUFF

"Do you believe in clubs for women?"

"Sure; clubs, sandbags, or anything."

—*Ardyth Huff.*

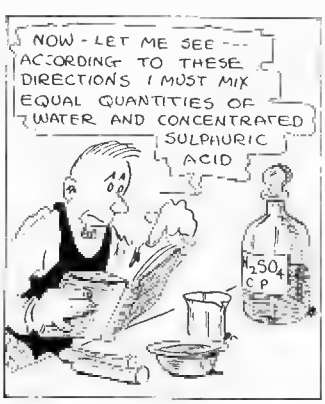
AFTER, OF COURSE

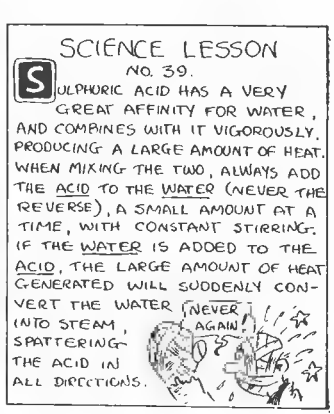
DIETICIAN—A few leaves of lettuce without oil, a bran cracker, and a glass of orange juice. Stick to that and your weight will come down.

FAT MAN—Well, that's fine, doctor. Now do I take that before or after meals?

—*C. H. R.*

Scienty Simon—*Scientist*


NOW - LET ME SEE --- ACCORDING TO THESE DIRECTIONS I MUST MIX EQUAL QUANTITIES OF WATER AND CONCENTRATED SULPHURIC ACID
H_2SO_4 C P


SCIENCE LESSON
NO. 39.
SULPHORIC ACID HAS A VERY GREAT AFFINITY FOR WATER, AND COMBINES WITH IT VIGOROUSLY, PRODUCING A LARGE AMOUNT OF HEAT. WHEN MIXING THE TWO, ALWAYS ADD THE ACID TO THE WATER (NEVER THE REVERSE), A SMALL AMOUNT AT A TIME, WITH CONSTANT STIRRING. IF THE WATER IS ADDED TO THE ACID, THE LARGE AMOUNT OF HEAT GENERATED WILL SUDDENLY CONVERT THE WATER INTO STEAM, SPATTERING THE ACID IN ALL DIRECTIONS.
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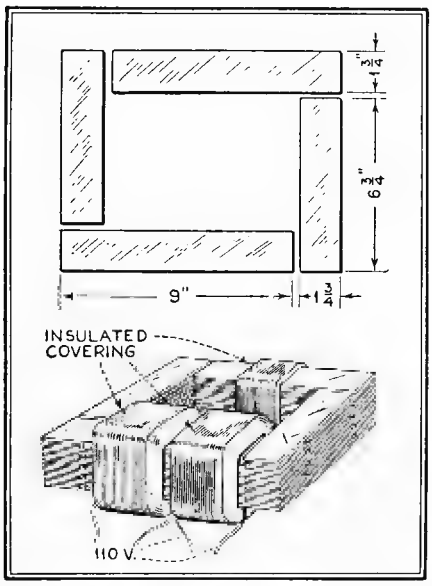
Pipe-Thawing Transformer

(2342) Eugene M. Debbs, Kalamazoo, Mich., writes:

Q. 1. Last year I had a great deal of trouble with the water pipes in my home. I remember that several years ago SCIENCE AND INVENTION published a diagram of a pipe-thawing transformer. Would you mind repeating this diagram?



An easily made transformer which will thaw pipes is shown above.

A. 1. We have heard so much of the success of this transformer that we are only too glad to publish the diagram again.

In a 110-volt circuit it will thaw ¾" to 1" metal service pipes and the time required will range from 10 to 30 minutes. The core of the transformer is made from sheets of stove pipe iron, the laminations being 1¾" x 6¾" and 1⅓" x 9". The core is then built up to give a cross section area of 1¾" x 1¾", with the laminations staggering at the corners in groups of five. The primary winding consists of 520 turns of No. 12 double cotton covered magnet wire divided into two parts of 260 turns each, which are parallel for operation on 110 volt circuits and connected in series for 220 volt circuits. The secondary is made by winding 38 turns of No. 1 bare copper wire upon the other arm of the transformer, the wire being separated from the core by suitable insulation. The entire outfit weighs about 55 pounds.

Pull of Locomotives

(2343) H. G. Wailes, Syracuse, N. Y., asks:

Q. Is there any simply expressed relationship between the weight of a locomotive and its tractive power.

A. Yes, there is a distinct relationship between the weight of a locomotive and the maximum tractive force it may exert on a load. According to the engineering department of the American Locomotive Co., the maximum tractive power of a railway engine is equal to about one-quarter the entire weight placed on the driving wheels. If the weight on these wheels were 200,000 pounds, the traction of the locomotive would be equal to 50,000 pounds. This factor is variable, and depends on such quantities as the grade, the rolling friction, and the steam pressure. This, however, is something which the average man fails to note in connection with his automobile. One cannot expect to develop high speed in his car, unless he has sufficient weight on the rear wheels to secure the maximum amount of traction.

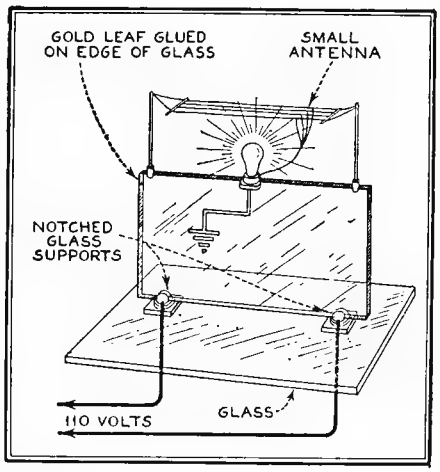
The Oracle

"Wireless" Electrical Display

(2344) John R. Sprague, Rochester, N. Y., writes:

Q. 1. Recently at an amusement park I saw an electrical novelty which was supposed to light a bulb without any connecting wires. Can you explain how this is done?

A. 1. We think the display you saw may be one which was recently patented and which is shown in the accompanying drawing. It consists of an upright glass plate whose edges are coated by extremely thin



A current carried along gold-leaf on the edge of glass contributes to the illusion of "wireless light," as shown above.

gold foil. This gold foil gives the appearance of the green color of the glass when the light strikes it. The gold leaf is connected to wires which run through the pedestals on which the glass is supported. An electrical circuit is formed by the conduction of the current along the gold leaf. The current reaches the bulb which is placed on top of the glass and the lamp is lighted. The aerial and the wire leading from the aerial to the bulb are merely placed there for their mystifying effect.

Tear Gas

(2345) Milton H. Webb, Los Angeles, Cal., writes:

Q. 1. I am very much interested in your series of articles on chemistry. Will you please tell me how to make tear gas?

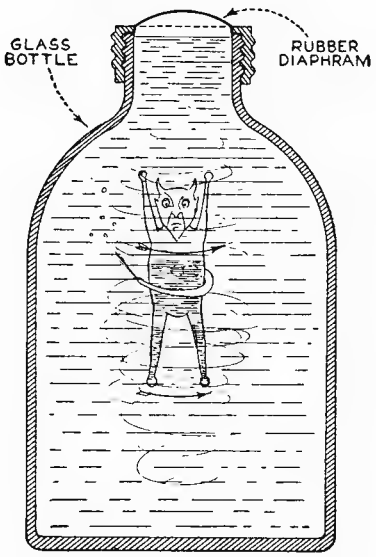
A. 1. Tear gas, which is more technically known as benzyl bromide is not very easy to make. It involves a knowledge of chemistry, and though we give the instructions here, we would not advise anyone trying to use this formula unless he is familiar with chemistry. It is formed by treating boiling toluol with bromine, particularly in sunlight and more rapidly if a halogen carrier PCl₅ is present.

Cartesian Diver

(2346) Louis R. Murray, Mt. Hamilton, Calif., writes:

Q. 1. A short time ago I purchased a novelty called "Diver" in one of the five-and-ten-cent stores. The little figure inside of the bottle would sink to the bottom on pressing the rubber cap on top. On releasing the pressure on the rubber cap, the diver would rise by twirling around. Can you tell me how this works?

A. 1. In order to find out just how this "Diver" worked, a member of the staff of SCIENCE AND INVENTION was commissioned to buy one of them. After racking his brain for about 24 hours, he finally completed his solution of this problem. The working principle of this toy is as follows: The bottle is filled with water, except for a slight air space at the top. The little hollow figure is placed in the bottle and the rubber cap adjusted. On pressing the rubber cap down, the water is forced in to the body of the diver through the very minute hole, which is often difficult to find, located in the tail of the figure. When the pressure on the rubber cap is released, the water leaves the figure rapidly through the tail. The reaction to the outflow of this water causes the diver to rapidly twirl around as it rises to the surface. The descending and rising is due to change of weight as water is forced into the figure by compression or as water escapes when pressure is released.



The Cartesian diver, shown above, works on an interesting principle of physics, and will provide much amusement.

"I GAMBLED 2¢ *and* WON $35,840 *in* 2 YEARS"

A Story for Men and Women who are dissatisfied with themselves

THIS is the story of a gamble—a 2c risk—which paid me a profit of $35,840 in two years. I am not, and never was, a gambler by nature; in all probability I never would have taken the chance if more money was involved. So even if you, too, are against gambling, you will feel like risking two cents after you've read my story.

Some people believe I was lucky. Others think I am brilliant. But this sort of luck I had everyone can have. My type of brilliance is that of any average man.

Almost any $40-a-week wage earner has as complete a mental equipment as I had two years ago. And he feels today just about the way I did then. For two years ago, I too, was in the $40-a-week rut. My earnings were $2,080 per year!

I was discontented, unhappy. I was not getting ahead. There didn't seem to be much hope in the future. I wanted to earn more money—a lot more money. I wanted to wear better clothes and have a car, and travel. I wanted to be on a par with people I then looked up to. I wanted to feel equal to them mentally and financially.

But it all seemed hopeless. I was beset with fears. I was afraid of losing my job. I was afraid of the future. I could see nothing ahead for myself and my wife and baby but a hard struggle. I would live and work and die—just one of the millions who slaved their lives away. I was irritable, easily annoyed, discouraged, "sore" at my fate and at the world. I could not think clearly. My mind was in a constant whirl. I was "scatterbrained." I had a thousand half-baked ideas to make more money, but acted on none of them.

The end of each year found me in about the same position as the beginning. The tiny increases in salary, grudgingly given to me, were just about enough to meet the rising costs of living. Rent was higher; clothes cost more; food was more expensive. It was necessary for me to earn more money. So once in a while I got a few dollars more. But it wasn't because of any great change in my ability.

Today I have an income of $20,000 a year. That's exactly $17,920 more than it was two years ago. A difference of $35,840 in two years. My family has everything it needs for its comfort and pleasure. My bank account is growing rapidly. I have my own home in the suburbs. I am respected by my neighbors, and I have won my wife and children's love as only the comforts and pleasures of life can do. When I am old I will not be a millstone around anyone's neck. My children will not have to support me.

I look forward to the future with confidence and without fear. I know that only improvement can come with the years. Once I wandered through life aimlessly, cringing, afraid. Today I have a definite goal and the *will* to reach it. I know I cannot be beaten. Once my discontent resulted in wishes. Today my slightest discontent results in action. Once I looked forward hopefully to a $5 a week increase in salary. Today I look forward confidently to a $100 a week increase in my earnings.

What magic was it that caused the change in my circumstances? How did I, a $40-a-week clerk, change my whole life so remarkably? I can give you the answer in one word—Pelmanism. I gambled 2c on it. Yet without it, I might have continued in my old $40-a-week rut for the rest of my life.

Pelmanism taught me how to think straight and true. It crystallized my scattered ideas. It focused my aim on one thing. It gave me the will power to carry out my ideas. It dispelled my fears. It improved my memory. It taught me how to concentrate — how to observe keenly. Initiative, resourcefulness, organizing ability, forcefulness were a natural result. I stopped putting things off. Inertia disappeared. Mind-wandering and indecision were things of the past. With new allies on my side and old enemies beaten, there was nothing to hold me back.

I am writing this in appreciation of what Pelmanism did for me. I want other average men to gamble 2c as I did. For the cost of a postage stamp I sent for the booklet about Pelmanism, called "Scientific Mind Training." Reading that free book started me on my climb. I took no risk when I enrolled for the Course because of the Institute's guarantee. All I gambled was 2c and I am $36,000 better off now than I would have been had I not written for the book about Pelmanism.

* * * * *

The Pelman Institute will be glad to send a copy of "Scientific Mind Training" to any interested individual. This book is free. It explains Pelmanism. It tells what it does to the mind. It tells what Pelmanism has meant to others. For over 25 years Pelmanism has been helping people to happiness. Over 700,000 others have studied this remarkable science. Among those who have praised it are such great world figures as Judge Ben B. Lindsey, Jerome K. Jerome, Sir Harry Lauder, T. P. O'Connor, Major Gen. Sir Frederick Maurice, H. R. H. Prince Charles of Sweden, and many others. Your whole life may be altered as a result of reading "Scientific Mind Training." Send the coupon. You have nothing to lose. If Pelmanism does not help you it costs you nothing. There is no obligation in mailing the coupon. No salesman will call on you. Decide for yourself what to do after you read the free book about Pelmanism. Mail the coupon NOW.

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I want you to show me what Pelmanism has actually done for over 700,000 people. Please send me your free book, "Scientific Mind Training." This places me under no obligation whatever.

Name.....

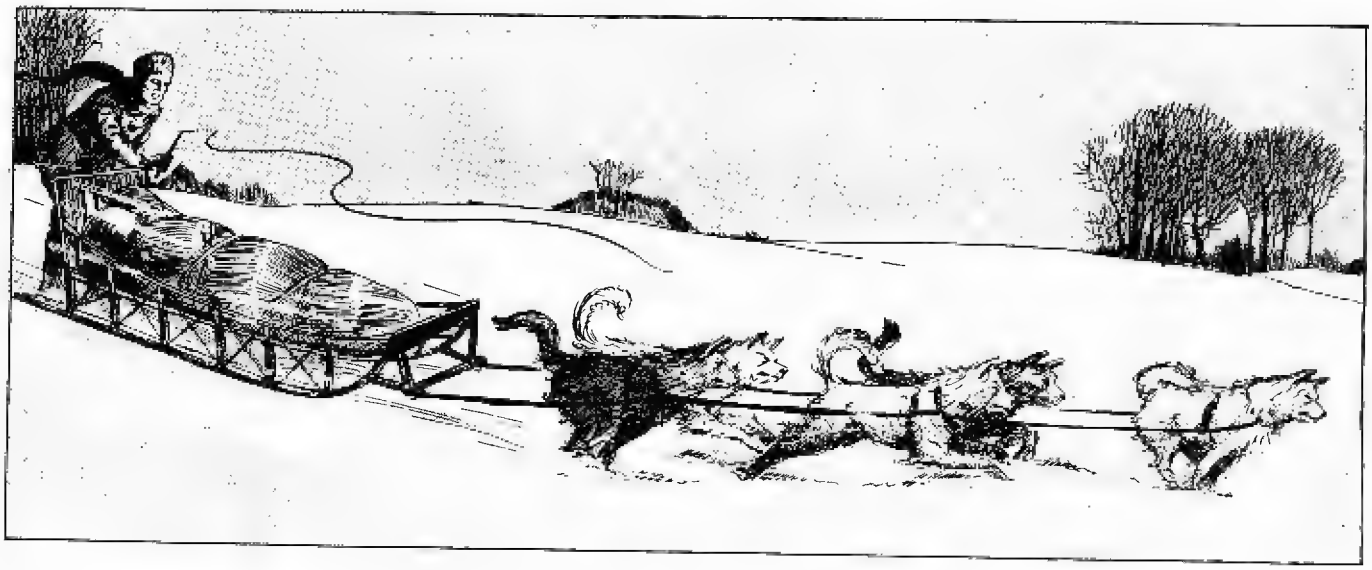
Address.....

City.....State.....

Solve *these* Brain Teasers *and* Win *a* Prize

By Sam Loyd

Jack London's Puzzling Ride



JACK LONDON once told a story that featured a dog-sled dash to the bedside of a dying comrade. The dramatic points of the narrative are forgotten, but I made notes of certain data which impressed me at the time as good puzzle material.

It appears that the famous novelist and adventurer set out with a 5-dog sled to mush from Skagway to his camp, some distance back in the frozen wilds. He started off in good style and his pups carried him along at schedule speed for the first day. Then two of the huskies heard "the call of the wild" and eloped with a pack of wolves. He had to continue with three dogs, which after the first day cut his pace down to three-fifths of his scheduled speed, and he finished his journey exactly two days late.

"Had those two renegades held out for another fifty miles," remarked Jack, "I would have arrived only one day behind time."

"How far was this hike of yours?" I inquired. Jack had forgotten, but, you see, he really had furnished me with sufficient data to answer my own question. I am going to ask our puzzlers to prove just how far Jack London mushed out from Skagway on that particular journey. Sharpen up your pencil.

TWENTY-FIVE DOLLARS IN PRIZES

THERE is no better mental training than the solving of clever puzzles, and to encourage exercise in this fine pastime, SCIENCE and INVENTION will offer its readers an opportunity to contest for monetary reward as well as to gain the benefits of a mental gymnasium that develops cleverness and ingenuity.

FIRST PRIZE, consisting of ten dollars in cash, will be awarded to the person who sends in the best set of correct answers and analyses to the three puzzles presented on this page: JACK LONDON'S PUZZLING RIDE and THE ACCOMMODATING METAL DEALER (two puzzles).

A SECOND PRIZE of five dollars will be awarded for the next best analysis and correct answers to the three puzzles.

TEN PRIZES, consisting of one dollar each, will be awarded to the ten persons who send in the next best sets of correct answers and analyses to the three puzzles.

By "best" is meant absolute correctness of solution—then, if other points must be considered, clearness of analysis.

In the diagrammatic problem it is not necessary to use the actual printed diagram. Copy the figure (two connected squares, one four times size of other) and use it to demonstrate your solution.

Answers must be received not later than February 15th, addressed to Puzzle Editor, SCIENCE and INVENTION, 381 Fourth Ave., New York City, N. Y.

All contestants must abide by the decisions of Sam Loyd, who will examine all papers and award the prizes.

Papers of identical merit, tieing for any one of the prizes, will each receive the full amount of the prize tied for.

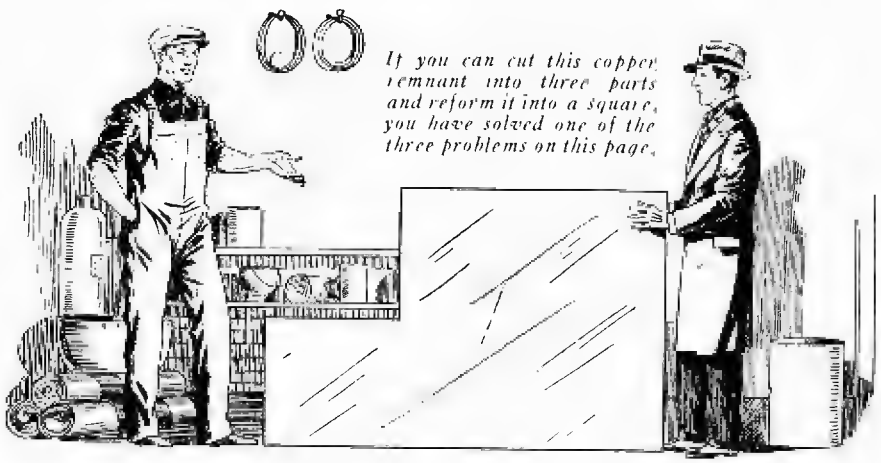
Answers and prize awards will appear in May issue.

The Accommodating Metal Dealer

"THERE'S the only piece of sheet copper I have on hand," said the metal dealer to his prospective customer. "As you see, it's a nice straight edged piece that will cut into two squares, one four times the size of the other."

"Oh, you want to use it all in the form of a single square. Very well, that's easily arranged, too. We'll cut this into three smaller pieces and fit them snugly together to form your one square. And I'll sell it at a remnant price; only 60 cents the square foot."

"Oh, you'd like to buy by the running foot. Very well, I'll make it 72 cents the running foot, measuring entirely around the piece, the total length of the six straight edges."



If you can cut this copper remnant into three parts and reform it into a square, you have solved one of the three problems on this page.

Back at his shop with his purchase, the customer carefully measured the square foot area of his metal, and ejaculated:

"That's astonishing; it would have cost me exactly the same by either method of charging.

Two propositions for our puzzlers to check up on:

First, to prove the dealer's statement that the copper remnant could be cut into three parts to reform into a square.

Second, to tell what the man paid for his metal, it being understood that the cost on the basis of 60 cents the square foot, or 72 cents the running foot for its peripheral length, would be the same. Don't forget that you are expected to demonstrate your solution.

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night

The very latest discovery in the scientific world. Hitherto, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, applied to the surface of any article, emits rays of white light, rendering it perfectly visible in the dark. THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES. Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crucifixes, Luminous Rosaries, etc. Small bottle, price 25c. Larger sizes, 50c and $1 postpaid. JOHNSON SMITH & CO. Dept. 952 RACINE, WIS.

CIGARETTE MAKER

Roll your own and save money. Better and quicker; saves more than half. Use your favorite brand of tobacco. Neat, useful, handy. Pocket size, weighs ½ oz. Made entirely of metal, nickel plated. 25c, 3 for 65c postpaid anywhere.

GOOD LUCK RING

Very striking, quaint and uncommon. Silver finish; skull and crossbones design; two brilliant, flashing gems sparkle out of the eyes. Said to bring good luck. Only 25c ppd.

Exploding Cigarettes

Box contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third smoked, the victim gets a very great surprise! It goes off with a loud BANG! A great mirth provoker yet entirely harmless. Price 25c box.

NOVELTY BADGES

Kissing Permit 10c " *Garter Inspector 10c*

Two very novel metal badges, nickel plated, that you can wear, giving you fun out of all proportion to their trifling cost. 10c, each badge, 3 for 25c, or 75c per doz. postpaid anywhere.

SURPRISE MATCHES

More fun than fighting with your wife. Look just like ordinary matches. Put up in boxes just like regular Safety Matches. As the victim tries to light one he gets quite a surprise. 10c

Price 10c per box, 3 boxes for 25c, 12 for 75 cents.

INVISIBLE INK

The most confidential messages can be written with this ink, for the writing makes no mark. Cannot be seen unless you know the secret. Invaluable for many reasons. Keep your postals and other private memorandums away from prying eyes. Great fun for playing practical jokes.

Only 15c a Bottle; 3 for 40c.

MIDGET BIBLE

GREAT CURIOSITY

Smallest Bible in the World. Size of a postage stamp, 200 pages. Said to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Make good money selling them to friends, church acquaintances, etc. PRICE 15c each. 3 for 40c, 12 for $1.25, 100 for $7.50. Also obtainable in Leather Binding, with gold edges. Price 50c each, 3 for $1.25, $4.50 per doz. Magnifying Glass for use with Midget Bible, 15c.

Wonderful X-Ray Tube

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your hand, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. A mystery that no one has been able to satisfactorily explain. Price 10c, 3 for 25c, 1 dozen 75c. Johnson Smith & Co.

STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 thousand postpaid.

STAR TOY MAKER

Greatest boys' book written. Tells how to make a Pinhole Camera, a Canoe, model Railroad, a Telephone, Boomerang, Telegraph Instrument, Box Kite, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Paddle Raft, a pair of Skis, a Dog Sled, Bird House, Rabbit Yard, etc. 64 pages. 150 illustrations. PRICE 10c or 3 copies for 25c.

MAGIC NOSE FLUTE

The Magic Nose Flute, or Humanatone, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it which, when once acquired after a little practice, will enable you to produce very sweet music that somewhat resembles a flute. There is no fingering, and once you have mastered it you can play all kinds of music with facility and ease. When played as an accompaniment to a piano or any other musical instrument, the effect is as charming as it is surprising.

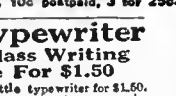
Post Paid 10c

BOOK ON ROPE SPLICING

Useful Knots, Hitches, Splices, etc. How different knots are made and what they are used for, knots that are unsafe, etc. Over 100 illustrations. All about wire rope attachments, lashing, blocks, tackles, etc. PRICE 20 CENTS OR THREE COPIES FOR 50 CENTS POSTPAID.

Serpent's Eggs

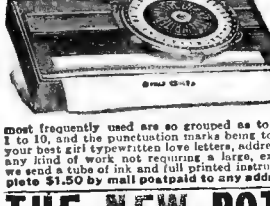
Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which curls and twists about in a most life-like manner.



Price per box, 10c postpaid, 3 for 25c.

The "Little Giant" Typewriter

A First Class Writing Machine For $1.50



A perfect little typewriter for $1.50. There are thousands of persons who would like to use a typewriter in their own home and business do not warrant the expense attached to the purchase and use of a fifty or seventy-five dollar machine. To such persons we confidently recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The letters of the alphabet most frequently used are so grouped as to enable one to write rapidly, the numerals 1 to 10, and the punctuation marks being together. With this machine you can send your best girl typewritten love letters, address envelopes, make out bills, and do almost any kind of work not requiring a large, expensive machine. With each typewriter we send a tube of ink and full printed instructions for using the machine. Price complete $1.50 by mail postpaid to any address in the world.

THE NEW POTATO PISTOL

Uses Potato for Ammunition

This is surely the most ingenious of all air pistols. For ammunition *ALL YOU NEED IS AN ORDINARY POTATO*, and that isn't hard to get. Merely place the point of the barrel of the pistol into a potato, as shown in the illustration, withdraw the pistol and fire. Nothing could be simpler. It fires quite a distance, goes off with a report like all air guns, and there is absolutely no danger. Well and strongly made entirely of metal. Price Postpd. Only 35c.

A De Luxe Edition of our new CATALOG mailed on receipt of 25c. Handsome binding. Bigger and better than ever. Only book of its kind in existence. Nearly 650 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., unprocurable elsewhere. Remit by Stamps, Coin, Money Order, Check, etc. Canadian and Foreign Stamps also accepted.

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Protection against Burglars, Tramps, & Dogs

Special Offer
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Well made and effective, modelled on latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard .22 Cal. Blank Cartridge — obtainable everywhere. Special cash with order offer: 1 Superior quality Blank Cartridge Pistol, 100 Blank Cartridges, and our new 550 page De Luxe Catalog of latest novelties; all for ONLY $1.50. Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. Special Holster (Cowboy Type) for pistol 50c. No C.O.D. shipments.

Throw Your Voice

Into a trunk, under the bed or anywhere. Lots of fun fooling the teacher, policeman or friends.

The VENTRILO

a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. *Never fails.* A 16-Page Course on Ventriloquism and the Ventrilo..... ALL FOR 10 Cents

LOOK 35¢ LOOK

Wonderful Instrument. Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, Curious and Interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngoscope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail. Only 35c or 3 for $1.00

PISTOL CIGARETTE CASE

It looks like a deadly weapon, but is merely a novel Cigarette Case. This clever contrivance has proved itself better than the real thing in many awkward encounter. Great fun "sticking up" your friends. They squirm and protest it might be loaded. Pull the trigger and the sides flies open disclosing the cigarettes. Well made, light and compact. Weight only 2 ounces.

Send at once and have all the FUN before everybody knows

PRICE POSTPAID 25c

MICROPHONE TRANSMITTER BUTTON

$1.00 Postpaid

You can easily make a highly sensitive detectophone by using this Transmitter Button to collect the sound waves. You can build your own outfit without buying expensive equipment. It is simple and inexpensive. You can install an outfit in your home and hear conversations being held all over the house. You can connect up different rooms of a hotel. This outfit was used by secret service operatives during the war. It is being used on the stage. It is ultra-sensitive and is the greatest invention in microphones. You can mount Button almost anywhere—card board boxes, stove pipes, stiff calendars, on the wall behind a picture frame, etc. Button is so light and small it cannot be detected. Persons can be overheard without suspecting it. You can listen in on conversations in another room. A deaf person in the audience can hear the speaker. Connected to phonograph, piano or other musical instrument, music can be heard hundreds of feet away. Button may be used to renew telephone transmitters; often makes an old line "talk up" when nothing else will. The ideal microphone for radio use; carries heavy current and is extremely sensitive. Amplifies radio signals. Countless other similar uses will suggest themselves. Experimenters find the button useful for hundreds of experiments along the lines of telephones, amplifiers, loud speakers, etc. Many fascinating stunts may be devised, such as holding the button against the throat or cheat to reproduce speech without sound waves. PRICE $1.00.

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment... $1.00

Anyone Can Do Them

It is great fun mystifying your friends. Get in Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket); The HINDOO TRICK CARDS (can be made to change completely no less than five times); The APPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination); The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth); the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE (no one but yourself is able to make it lay down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat), and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other feats and illusions are fully explained for which you can easily make or procure the necessary apparatus. Price complete $1.00 postpaid.

DISSOLVING VIEWS

50c

You may have a lot of fun with this little peep-show. A regular startler. Made entirely of metal, having a microscopic lens fitted into one end. While the victim is absorbed in admiration of the pretty picture and turns the button in the confident expectation of seeing something interesting, a spring syringe is brought into action, and the observer experiences a very great surprise. 50 cents each postpaid. JOHNSON SMITH & CO.

Lover's Knot or Friendship Ring

Made of 4 strands of genuine 14K gold filled wire, woven into the True Lover's Knot, symbolic of love or friendship. Very pretty, yet not showy. Each ring is made by hand by gold wire expert. It looks good and it is good. Price 50c Postpaid Johnson Smith & Co.

Rubber Chewing Gum

It is just like a regular package of chewing gum and looks so real that it fools everybody. Of course no one suspects it is not genuine until they start to chew it. There's a world of fun in this rubber chewing gum — 5 sticks to the package. Price, 10c PKG.; 3 for 25c; 12 for 75c postpaid.

Rubber Cigarettes. Price per Box. 20c
Rubber Matches. Price per Pkg. 10c

BABY TANK

25 Cents

2¼ inches long

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down it will crawl along, overcoming all obstacles, in the most life-like manner as the larger Tank that proved so deadly in the great war. What makes it go is a mystery, for there is no mechanism somewhat of a mystery, for there is no mechanism somewhat understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run of toys. It will perform dozens of the most wonderful stunts. 25c prepaid.

ITCHING Powder

This is another good practical joke of the intense discomfiture of your victims to everyone, but themselves is thoroughly enjoyable. All that is necessary to start the ball rolling is to deposit a little of the powder on a person's hand and the powder can be relied upon to do the rest. The result is a vigorous scratch, then some more scratch, and still some more. 10c box, 3 boxes for 25c or 75c per dozen. Shipped by Express.

ANARCHIST BOMBS

One of these glass vials dropped in a room full of people will cause more consternation than a lumburger case. The smell entirely disappears in a short time. 10c, per Box, 3 Boxes for 25c., 75c per doz. Boxes, or $7.50 per gross Boxes. Shipped only by Express.

SNEEZING POWDER

Place a very small amount of this powder on the back of your hand and blow it into the air, and everyone in the room or car will begin to sneeze without knowing the reason why. It is most amazing to hear their remarks, as they never suspect the real source, but think they have caught it one from another. Between the laughing and sneezing you yourself will be having the time of your life. For *parties, political meetings, car rides*, or any place at all where there is a gathering of people, it is the *greatest joke out*. Price 10c, 3 for 25c, 75c per dozen. Shipped by Express.

COMICAL MOTTO RINGS

Lots of harmless fun and amusement wearing these rings. Made of platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. Price 25c ea. Postpaid

MAGIC MADE EASY 250 MAGIC TRICKS 10c

An excellent little book containing 250 Parlor Tricks, tricks with cards, coins, handkerchiefs, eggs, rings, glasses, etc. So simple that a child can perform them. Profusely illus. Sent postpd. to any address for only 10c. 3 copies for 25c.

ADDRESS ORDERS FOR ALL GOODS ON THIS PAGE TO

JOHNSON SMITH & CO. DEPT. 952 Racine, Wis.

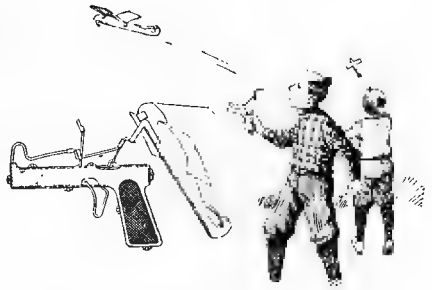
Latest Patents

Hand Vacuum Massage

No. 1,730,535, issued to Alfred P. Rudolph. The object of this device is to provide a means of vacuum suction. Consists of a tubular member, a slidable piston, a spring which holds the piston in place, a plug for closing one end of the tubular member. A pin, extending outward, forms a slot, which slides the piston up and down.

Notice to Readers:

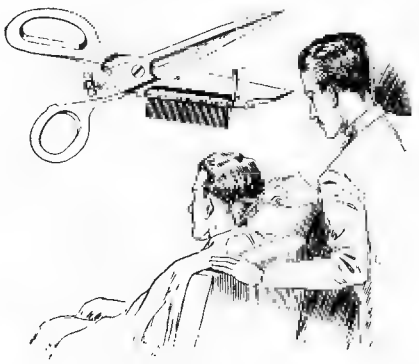
AN appreciable period of time elapses between the filing of a patent and the date upon which the patent is granted. During this interval inventors frequently move. We regret that it is quite impossible for us to supply the correct addresses of persons whose inventions appear on this page, nor can we furnish information about when the product may appear on the market. Attorneys who prosecuted the patent cases can furnish the most reliable data. Copies of patents are available at ten cents each from the U. S. Patent Office, Washington, D. C.



Sling-Shot Pistol

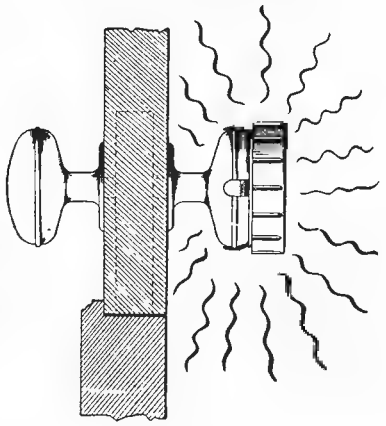
No. 1,726,593, issued to Leo Stawinski. The object of this invention is to provide a toy gun or pistol, in which by the action of a spring, a missile is hurled into the air at the same time of the firing of the cartridge. The device consists of a trigger co-acting with a resilient arm which is slotted for holding special model airplane.

Comb and Scissors Combined



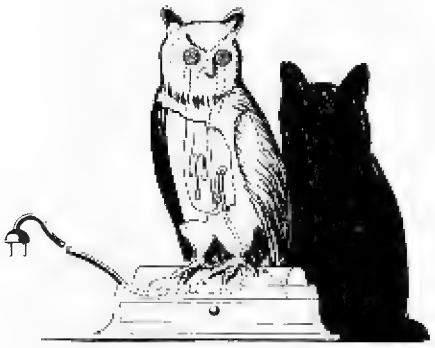
No. 1,726,390, issued to John W. Erhard and Amtoinette Erhard. This patent relates to a device for combing and cutting the hair and also a means of gauging the length of the hair cut off. It consists of a pair of scissors, two shear members pivotally connected, a rod with a comb on it and a rack and pinion for rotating the comb upon opening and closing the scissors.

Burglar Alarm Door-Knob



No. 1,731,605, issued to Willard L. Baker. It is an attachment for door knobs which will warn the occupants of the house whenever the knob is rotated from the outside. The device consists of a bell which is made in the form of a knob, and which rings on rotation.

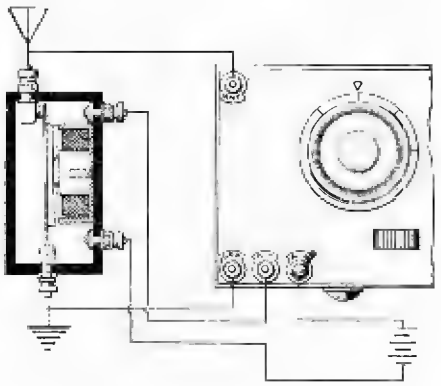
Novel Cigarette Lighter



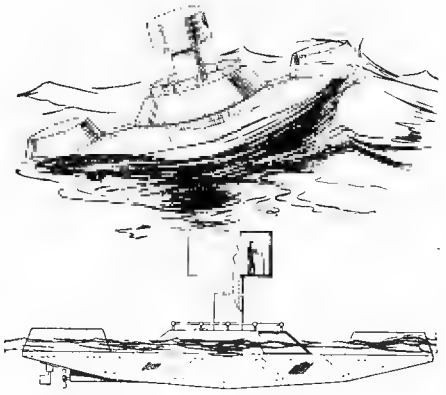
No. 1,727,002, issued to William B. Weaver. This lighter is a novelty using the form of an owl to contain coils which are heated to incandescence. The eyes of the owl contain the coils which are heated to incandescence; the base of the figure is equipped with an off-and-on switch. When the eyes light up they give the impression of an owl blinking.

Automatic Grounding Relay

No. 1,128,408, issued to Walter L. Hintz. This device relates to improvements in grounding relays which automatically disconnect and connect the antenna by means of the battery or eliminator switch. It is effected by an electric magnet connected across the two binding posts, which is actuated by a switch.



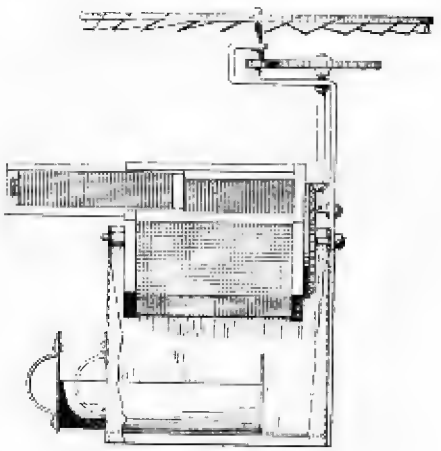
Roll-less Speed Boat



No. 1,726,618, issued to Monroe Green. This patent applies to an invention for reducing to minimum rolling and pitching. Consists of a series of floats connected by girder construction so that none of these floats is on the crest of the same wave at the same time. The inventor claims his arrangement will stabilize ships or may be used for pontoons on seaplanes.

Self-Operated Corn Popper

No. 1,730,515, issued to Harold S. Lewis, is a device for popping corn which may be used with any heating medium, and which uses this heat to rotate the popper. This is done by shunting the heat to a fan structure which permits rotation.



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A well known cartoonist's conception of my idea

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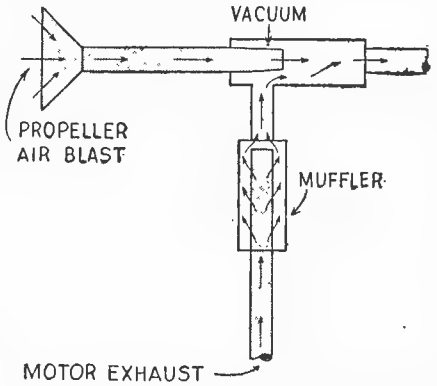
Airplane Exhaust Silencer

(1202) John J. Porta, of Elliott, Pittsburgh, Pa., has designed an exhaust silencer for airplanes, the nature of which is made clear in the appended diagram. He asks for opinion on the same.

A.—There has never been any great difficulty in silencing the engine on an airplane. While most silencers decrease the power which the engine would give, if it



were unsilenced, and while such silencers are used on some planes, it is quite impossible to do away with the noise created by the propeller.

There is no doubt but that a market for a product that will do this could readily be found, provided there would be no material lose in power.

While we can see no advantages to your system, we would certainly suggest that you work upon the other idea of eliminating propeller noise.

Calendar Reform

(1203) M. M. Gale of Groton, N. Y., has designed a calendar to fit the calendar reform which will indicate the dates of the new and old systems in each individual block.

A.—First, your idea is not patentable. It could be copyrighted, but then the protection which you get is not very broad. Secondly, there is no indication that the calendar reform will be accepted. If accepted, a thousand and one organizations will produce a calendar very similar to yours, because there is nothing unique about it.

Unless you yourself published these calendars, we are doubtful if you could get any financial return.

Dust Mask

(1204) Mrs. S. Brooks, Paris, Ontario, writes:—

The farmers have needed a dust mask for years to wear at threshing time to keep dust out of their eyes, nose and lungs. Do you think I should follow up this idea.

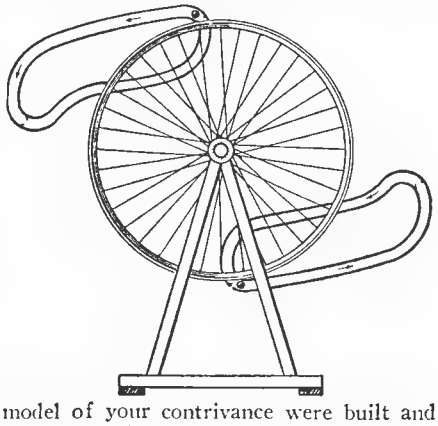
A.—Not knowing the nature of your idea it would be quite impossible for us to advise as to whether you should proceed further with it or drop the matter entirely. We would suggest that you communicate with organizations that manufacture masks of all kinds and get copies of their catalogs.

Perpetual Motion

(1205) W. R. Bee, Minneapolis, Minn., submits a diagram for producing perpetual motion. According to the description the apparatus consists of a bicycle wheel, mounted on a suitable holder and on the rim of the wheel are two hollow cylindrical tubes of steel, fastened as indicated. A metallic ball is placed in each tube and because of the way it rolls it is supposed to keep the apparatus in motion.

A.—While it is perfectly true that the metal ball when at the far end of the cylindrical steel tube, will tend to cause the wheel to turn, it is also true that this ball must be lifted through an appreciable distance without producing any motion. Therefore, the additional force which you obtain on one side of the machine is exactly counteracted by the fact that the ball must be lifted through an appreciable distance on the other side in order to start its operation again. The result is that the wheel will remain absolutely stationary.

SCIENCE AND INVENTION magazine still offers an award of $5,000 to any one who will merely demonstrate to the editor's satisfaction, a working model of a perpetual motion machine. From this challenge are excluded devices that work by wind-power, waves, tides, waterfalls, atmospheric temperature changes, barometric pressure changes, evaporation, humidity, sun-power, and a demonstration of the "Brownian movement." If a working



model of your contrivance were built and demonstrated to be devoid of trickery, it would come within the scope of our contest.

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(*Continued from page 907*)

back towards the trailing edge of this part of the rib to help maintain the shape. Make 2 Special Compression ribs which are to go into the Aileron Section of the wings as shown in the Wing Chart on Plate No. 2. These Special Compression ribs are made up as a Compression rib from the Leading Edge to the Back Spar but left open like an Aileron Rib from the Rear Spar to the Trailing Edge.

LIST OF RIBS

14 Regular Ribs.
8 Compression Ribs.
8 Aileron Ribs.
2 Special Compression Ribs.

32 Ribs in all.

SPARS:

There are 4 Main Spars and 2 Aileron Spars. Sitka spruce is best but straight grained spruce, free from knots, can be procured from lumber dealers in nearly every section of the country and will be satisfactory. The 4 Main Spars are cut 16'—1" long by 3 3/8" wide from 11/16" thick Spruce. A 12" long taper is next sawed at one end of each Main Spar, for the wing tip shape, as shown in Plate No. 2. A 1" by 1-7/8" angular cut off is made to the other end of each Main Spar, to conform to the metal fitting F25, as shown in Plate No. 2. It is best to cut one Main Spar and use it as a pattern for marking the other three Main Spars so that when cut they will all be alike. The top and bottom surfaces of two Main Spars are planed to fit the openings for spars in the ribs shown on the regular rib pattern in Plate No. 1. Two Main Spars are planed for right wing ribs and two Main Spars are planed for left wing ribs. The 2 Aileron Spars are cut 6'-4½" long by 3" wide from 7/16" thick Spruce with a 12¼" long taper sawed at one end of each as shown in Plate No. 2. The top and bottom of these Aileron Spars are planed to fit the Aileron Ribs at a point 1" back from the Rear Main Spar. One Aileron Spar is planed to fit the right wing and one is planed to fit the left wing. The 1" allowed between the Rear Main Spar and the Aileron Spar is the space necessary for the Aileron Hinges which are to be fitted later.

The metal fittings necessary for the wings should next be made. Make 8 fittings like drawing F 25. These may be bolted at this time to the butt end of all the Main Spars. They are put on in pairs one fitting on each side of each Main Spar using 4 machine bolts ¼" x 1¼", to hold them to each spar end. It is important to have the ½" hole in the pointed end of this fitting protrude about ½" beyond the Spruce Main Spar ends so that the bolt which later is inserted will have clear passage. These F 25 fittings should be attached in exactly the same position on all four of the Main Spar ends which are sawed off to receive them. Make 16 fittings like drawing F 12. These fittings are drilled with four ¼" holes and are bent as shown in Plate No. 2. Make 8 fittings like drawing F 22. These fittings are drilled with three ¼" holes in the square main plate and the two 7½" x 1" straps are securely riveted near the center of the square main plate with a good 3/8" iron rivet securely headed. The ends of these straps have a ¼" hole drilled at their free ends. Make 50 fittings like F 4. ¼" holes are drilled in each end of this fitting and a ¼" copper rivet can be flatly headed in one of these holes and drilled with a ⅛" hole in its exact center thus forming a copper bushing. Make 2 Aileron Pulley Sets like drawing F 13. It is best to buy the pulley wheels from an Aviation Supply House. The Heath Airplane Co. sells a good aluminum 1¾" pulley for 25c each. 10 Aluminum Pulleys 1¾" diameter will be required for the glider and it is best to make or secure them all at this time. The metal brackets are bent to allow just clearance enough at their base for the pulleys to turn freely so that there will not be room enough for the cable to work out or bind.

Make 5 Horns as shown on Plate No. 2. ¼" thick Spruce is cut to shape and sanded smooth on each side. Plywood sides are next shaped and then glued to each side of the spruce horn. If the whole Horn Assembly is placed between two small boards and left to dry under the pressure of a clamp it will be very strong.

The wings may next be assembled. Take a right front main spar and a right rear main spar and mark them with a pencil showing the exact position of each rib. The ribs are slipped onto the spars from their tapered end along to their respective positions. Be sure to have the Compression Ribs, Regular Ribs and Aileron Ribs in their proper places. The metal fittings F 12 are next placed in position against the spars under the upright strips of the Compression Ribs. ¼" holes are drilled through the spars and these fittings bolted tight with ¼" x 1¼" machine bolts. The metal fittings F 4 are next placed in position and ¼" holes are drilled through the spars for the ¼" x 1¼" machine bolts which secure

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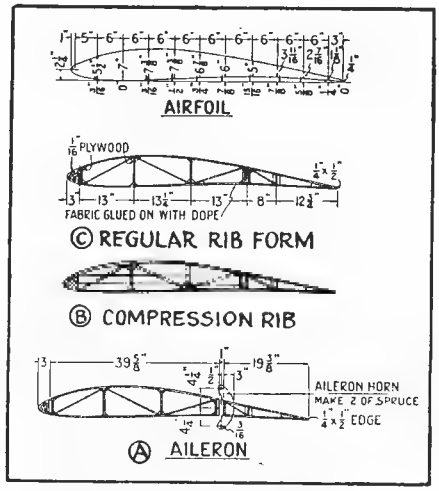

Glider Rib Details. Plate No. II.

them. A ¾" half round spruce strip is glued and nailed to form the end of the wing and complete the tapered form of the spar ends. It is best to further secure this strip by gluing and nailing triangular plywood gusset plates between it and the spars. Each rib is securely nailed and glued, in its exact position, to the spars. Never drive nails through the top and bottom battens of the ribs into the spars for this weakens the ribs at this point. The writer has found that the ribs can be toe-nailed at an angle through the inside upright rib strips into the spars. Use plenty of glue in securing the ribs to the spars.

New Telephone Magic

(*Continued from page* 887)

buttons; nothing else was visible. Probably most people are familiar with the principles of the dial telephone system, or as it is more technically known, the machine switching system. When a person moves the little perforated disc above the indicator dial around to the stopping point, impulses are set up in the line which actuate a motor, which in turn operates a sliding selector. This selector picks out the number desired with more than human precision and completes the call through the desired station—provided that station called is also a machine switching office. The entire problem of telephone laboratories has been to effect a means of connecting up the machine switching station with the manual switching station where the operator makes the connections. Heretofore a translucent plate, containing a series of digits, behind which there were corresponding pilot lights, has been used. When a number selection came in from a machine switching station, the lights behind the desired numbers would appear and thus the operator would know the number the subscriber was calling, and then could complete the call. The drawback to this system was mainly a matter of finance. This system required intricate relaying arrangements which were very costly and required too much time to install. The "call announcer" was designed to eliminate this costly installation.

It consists of the following parts: a synchronizing motor driving a long shaft on which there are seven drums. Each drum has two strips of sound film on its outer surface. On each strip of film there is recorded a digit, from one to ten. This digit is repeated four times on the same strip of film. In front of the drum is a very bright low-powered light which focuses on the film through a very minute slit. Behind this slit, on the inside of the drum, there is a photo-electric cell which is connected to a three stage amplifier. The head phones of the operators of the manual board are connected to the amplifier; though our artist has shown a speaker connection merely to clarify the details. As the entire apparatus has seven drums with two strips of film on each drum, fourteen strips are accounted for. On the dial there are only ten numbers; the other four are for party letters.

When the subscriber picks up his dial phone he hears the buzzing noise. He dials the number he wants. The dialing actuates the machine selector. The machine Selector sends the electrical-impulses over the wires to a set of relays connected to the "call announcer." The relays transmit the impulses, and the sound from the films corresponding to the desired numbers are sent through the amplifiers to the operator, who completes the call. It should be understood that the entire seven drums are revolving continuously; the relays merely complete the circuit to the drums on which the films are mounted that have the desired numbers.

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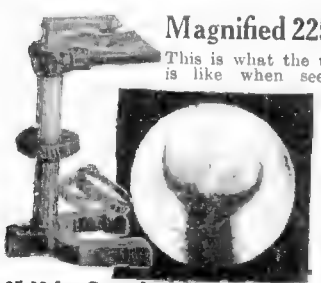

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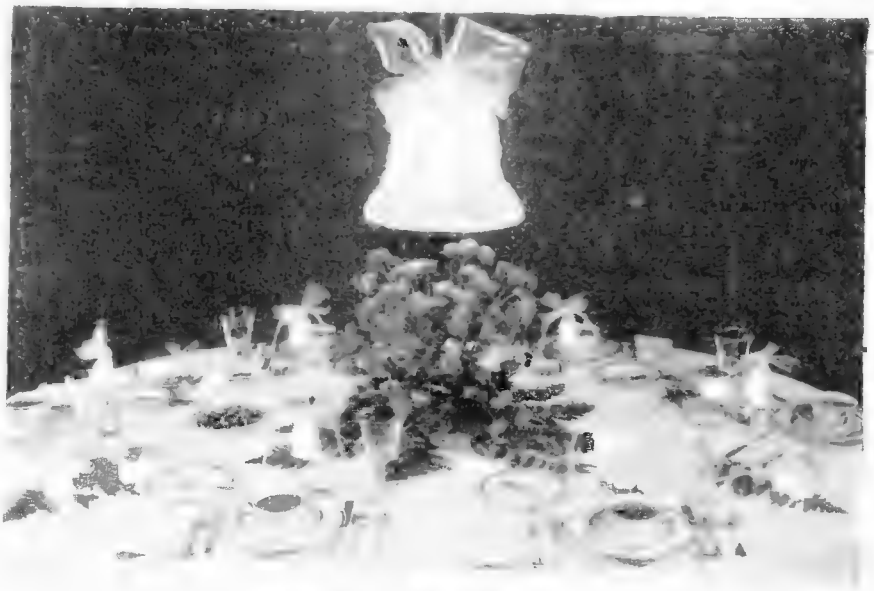
Illuminated Table Novelties

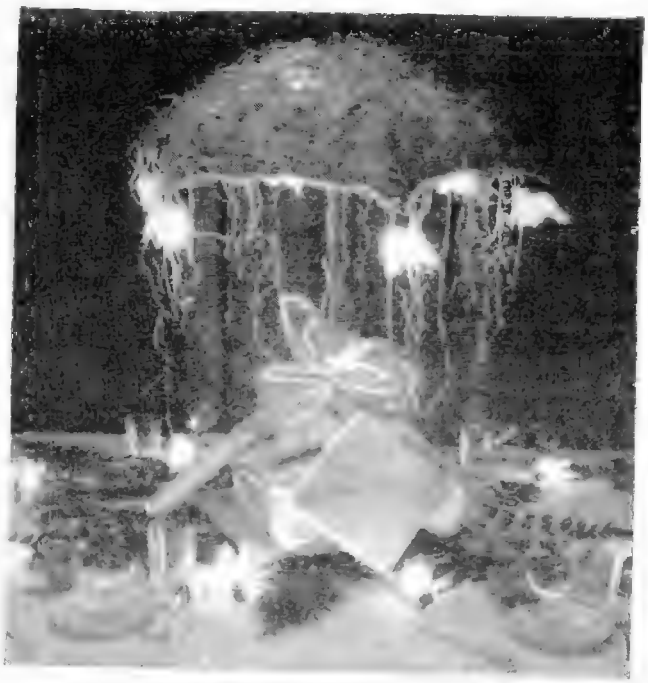
By Joseph W. Von Stein

(Concluded from January issue)



Illuminated bells suited to many occasions.

LIGHTED PLACE CARDS—Wire on a cord every 20 inches as many intermediate screw base sockets as there are guests. To make the sockets stand upright, drill a small hole in the base of each, and place it over a half-inch nail protruding through the center of a 2½-inch disc of beaver board. This disc forms the base on which the socket rests and the decorations composing the card are built of colored papers pasted to the socket. When strings of series lamps are used, they will stand upright by binding about 6-inches of the cord with supporting wire, one end of which is twisted into a flat spiral.



Illuminated flowers.

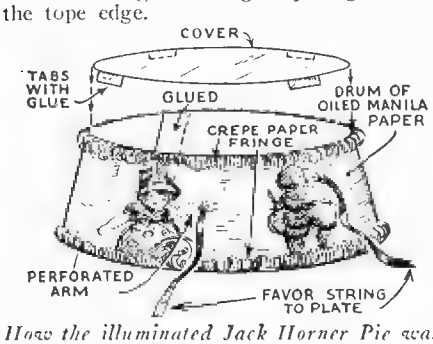
Electrically lighted Jack Horner Pie.

Electric lights are often placed inside small dolls with excellent effect.

LIGHTED FLOWERS—A bouquet is easily made by following, with slight variations, the simple instructions given by the manufacturers of crepe paper for the making of paper flowers. The head can be built about an intermediate screw base socket wired with about 18 inches of insulated wire, and bound with green crepe paper to serve as the stem. Each flower, separately made, is placed in a basket or vase. Wiring connections are made in the bottom of the container so that the flowers are in multiple and only one silk-covered extension cord extends from vase to lighting outlet.

Colorful baskets or vases are easily made from cardboard with wire for handles. Rainbow ruffles or sections of crushed crepe paper are pasted on the surface, and the handles bound with colored paper or with bows of maline ribbon. The basket can be made translucent if the entire frame is of wire covered with paper. A lamp concealed among the stems of the flowers illuminates the basket and sheds a glow of light over the table.

AN ILLUMINATED JACK HORNER PIE—This essential adjunct to any party—from the child's viewpoint—is readily constructed as shown in the illustration. This box covers a 60-watt Mazda lamp and the children's favors. Strings from favors run through the sides of the pie. If it is desirable not to have the sides torn when the favors are drawn, the arms of the nursery figures can be partly cut out and small favors attached, or the top of the pie may be left loose and the favor-ribbons brought through openings about the tope edge.



How the illuminated Jack Horner Pie was made.

Following these general instructions, innumerable unique and original lighted decorations can be built up. Inasmuch as many decorations differ only in the color of paper or the motif of ornament employed, there are numerous effects to be had from following general principles. For example, a Valentine set-up might differ from a St. Patrick set-up only in that the former would employ red paper and hearts, while the latter would employ green paper and shamrocks. Similarly patriotic occasions can be celebrated. A lighted figure of Betsy Ross might grace the Flag Day table amid a setting of colonial American flags, while a cherry tree centerpiece where the cherries are represented by red bulb lamps could suggest nothing but Washington's birthday.

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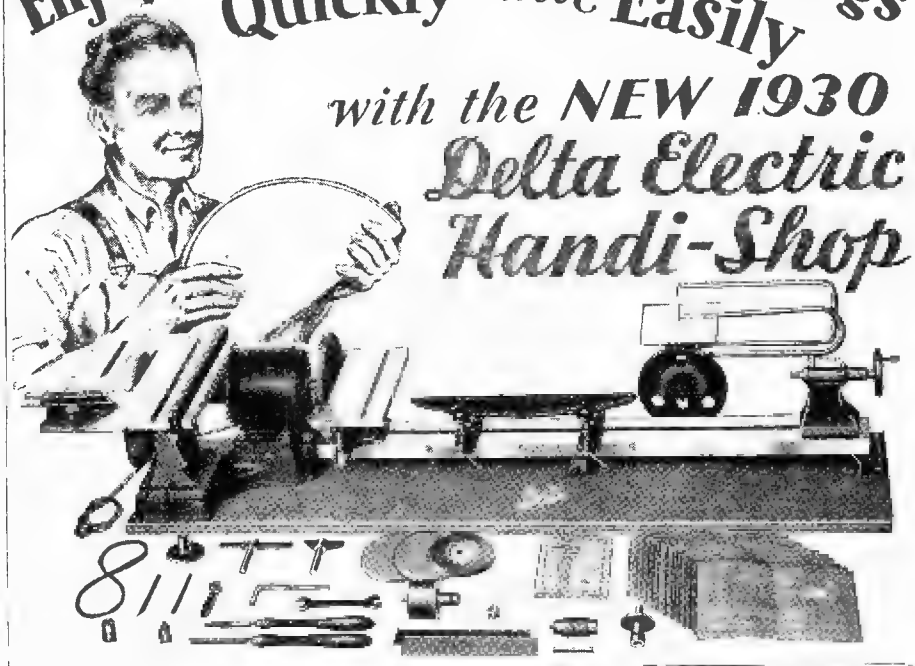

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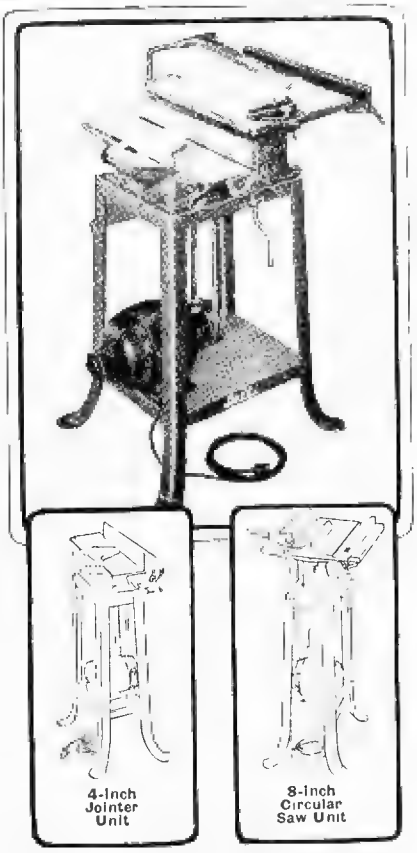

The individual units are built ruggedly to give years of heavy service. Both incorporate many special features of great value. Furnished with or without motor.

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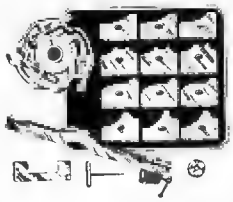

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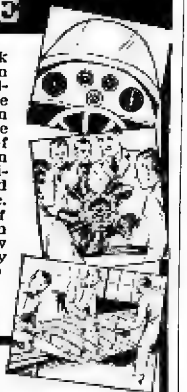

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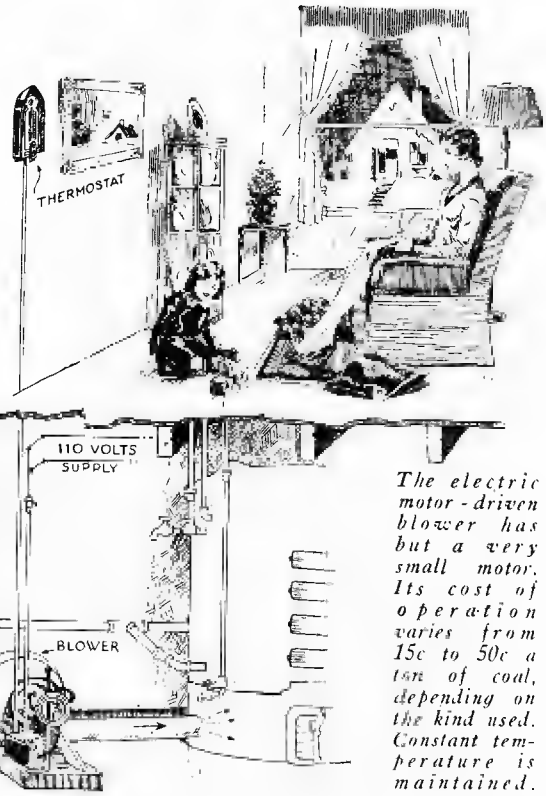
Two New Draft Controls

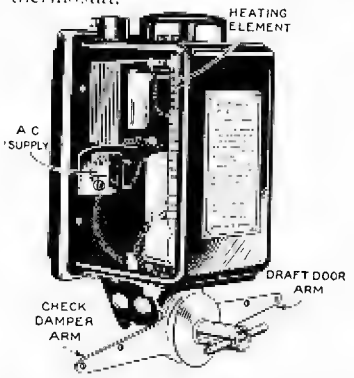
Thermostat Controlled Drafts Regulate Temperature and Cut Coal Costs

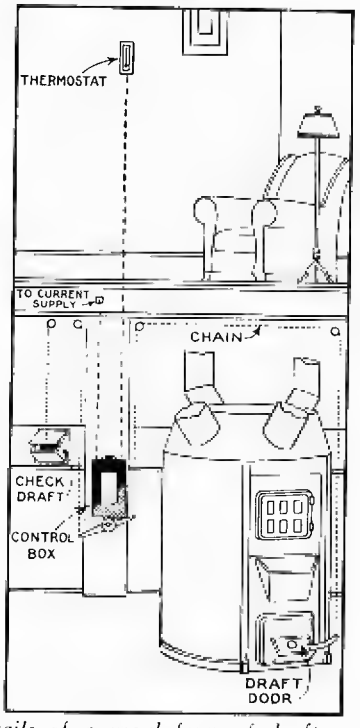
IT is very unfortunate that the furnace does not know what is going on in the rooms up-stairs so that it could regulate its drafts and maintain a constant temperature in the home. That is the object of various types of furnace draft controls that have recently been put out on the market. Contrary to the usual expectation, these furnace draft controls actually save money because they regulate the temperature to a nicety and prevent the unnecessary opening of windows and ultra-firing of the furnace to get up that first heat. The first of these illustrated at the right, the Germeyer system, has a thermostatically controlled blower that supplies the draft. The second, the Sheer-Comfort Heat Control, illustrated below, has a heat-operated expansion chamber, which regulates the draft door and the check damper. In both there is a low voltage supply to the thermostat.



The electric motor-driven blower has but a very small motor. Its cost of operation varies from 15c to 50c a ton of coal, depending on the kind used. Constant temperature is maintained.

The thermostat which is pre-set is operated from a low voltage supply leading to the motor where the current is turned on, regulating the amount of draft to the furnace. Cheaper and poorer grades of coal are thoroughly burned with this forced draft.





Details of a novel form of draft control which opens and shuts doors on check draft and at bottom of furnace.

A Priscilla Sewing Stand

(*Continued from page* 904)

very nicely. The box sides and bottom are fastened together with nails and glue. The ends are made of one-half inch material; a paper pattern is made for the outline and the cutting is done with any available saw for cutting curves.

Final Assembling

THE handle should next be shaped and fitted to the posts by boring a half-inch hole in the ends of the handle, into which the top end of the post is fitted, and glued later. A cross piece, separating the lids and mortised into the post and another cross piece at the bottom, are now made. The feet are cut to shape and fitted either with a mortise and tenon joint, dowels, or evenly with screws.

In the assembling, it is well to glue all parts together where possible. The box portion should be glued to the legs, and either nailed or screwed also from the inside. The handle and stretchers should also be glued. Care must be taken in gluing and the work should be done in a warm room to prevent the glue from chilling, and to allow ample time for placing and setting of clamps.

The Lids

WHILE the glue is setting, time may well be employed in making the two hinged lids for the box. They are made of half-inch material and the outside edge is built up with a ½-inch x 1-inch strip to give a rounded thick edge. Material should be very carefully selected for the lids, to get well seasoned flat wood; otherwise warping and twisting may result. Another note of warning: Finish both sides of the lid exactly the same and with the same number of coats of finish or warping may result.

Your Car Gets the Third Degree

By M. M. Roberts

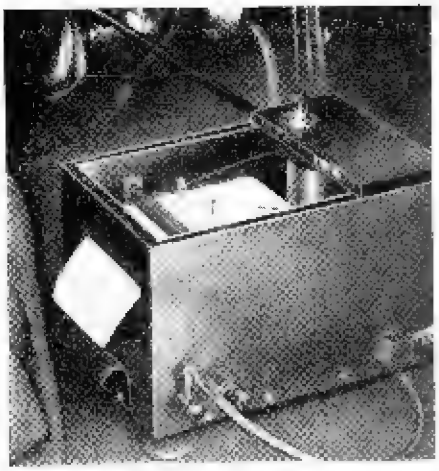
(*Continued from page* 892)

gaged in designing new test equipment and otherwise increasing the facilities of the proving ground as well as to keep accurate records of automotive improvements. Each division is engaged in a continuous test of its own products and trying out new ideas of its engineering staff.

Fleets of Test Cars

These new ideas were intriguing, for they represented the work which has resulted in all new models and new automobiles produced during recent years by General Motors. The engineers were agreeable and volunteered to show how a new car was tested in every detail before it was offered to the public. They used as an example the Viking, one of the newest General Motors products.

The Viking engineers, they explained, approached their work of designing a new automobile with an open mind, literally



Above is a decelerometer for testing brakes of auto. Instrument registers pressure applied.

starting from scratch. They investigated all types of cars, past and present, as well as tried out new engineering principles. They were striving for a balanced automobile, one which would give the motoring public endurance, safe braking qualities, speed, comfort, driving ease, acceleration, economy of operation, quietness and strength.

The engineers built fleets of cars so that they could determine beyond question just how their ideas, combined in this new automobile, would perform under any and all conditions. And at this stage of the development work the proving ground enters the picture—in fact, dominates it.

These fleets of cars were operated over every type road and grade during a period covering both extremes of the thermometer. Scientifically correct instruments, many especially designed for this work, were used to test every type of performance of this fact-finding fleet.

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Speed Tests

WHAT they termed a fifth wheel speedometer was hooked to the right running board of the Viking. It consisted of a bicycle wheel which runs parallel to the right rear wheel of the car. This bicycle wheel is connected by a belt to an electric generator fastened to the running board. This, in turn, is wired to a voltmeter held by the tester seated beside the driver in the car. The dial of the voltmeter is divided into miles per hour instead of volts and the hand actuated by the electrical current accurately records the actual mileage of the car. The dial is double, one set showing from 1 to 50 miles an hour and the other from 1 to 100 miles an hour. Recently the engineers have designed one showing speeds up to 150 miles an hour.

Maximum speed tests are made on *concrete straightaways* only, of which there are two at the proving ground, beside those which form part of the 3.8 mile speed loop. Each test is run both ways of the track and the time for the two runs averaged to eliminate the factor of wind resistance. The fifth wheel speedometers are raised and lowered from the road by vacuum, controlled by the operator when turning or leaving the straightaways. The fifth wheel speedometers also are used for distance runs, when cars are operated days at a time at set speeds to determine endurance and similar factors.

These fifth wheel speedometers are considered extremely accurate and are frequently checked against stop watches. But they are not deemed sufficiently accurate over the short distances used for acceleration tests. So the General Motors engineers designed the photographic accelerometer.

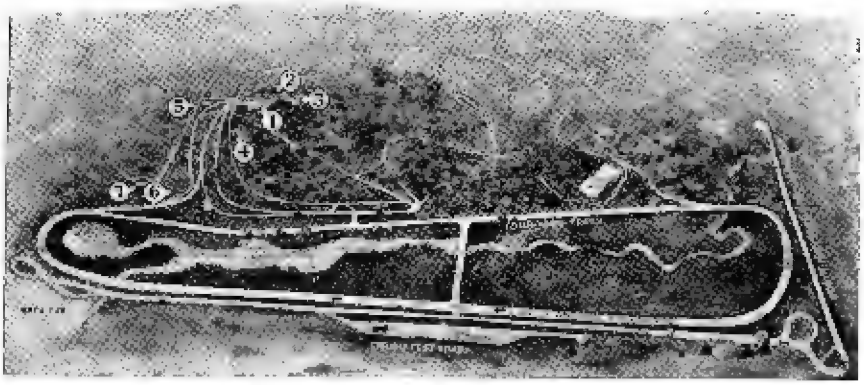
This instrument consists of a similar fifth wheel which is hooked up to the two moving disks instead of an electric generator. The disks are contained in an enclosed case containing a moving picture outfit which is electrically connected with a clock carried inside the car.

The two disks are marked, respectively, in feet and in tenths of a foot and are actuated by the fifth wheel. The clock, which is a ship's chronometer set in gimbals so that it always is level, actuates the moving picture machine, making one exposure each second. The film records the reading of the two disks each second and in this manner the engineers obtain an accurate photographic record of the actual distance traveled each second. These tests are run to record the actual time taken to accelerate from 5 to 25 miles an hour and from 10 to 35 miles an hour. The Viking easily reached 35 miles in slightly more than 10 seconds.

Fuel Consumption Tests

TO show how accurately gas consumption is measured in proving ground tests, a *flowmeter* was attached to the front compartment of the Viking. This is a burette, or tube, scaled to show its cubic centimeter content of gasoline. It is filled to its maximum capacity of 700 c.c. by two pumps at the base of the burette and connected with the gasoline tank.

Before being tested the Viking car was first driven until it reached its most efficient operating temperature. The test is made over a course accurately marked each tenth of a mile. At the end of each run the exact amount of gasoline consumed and the speed traveled are recorded. Test runs are made at varying speeds from 10 miles an hour, to maximum speed. The gas consumption curves plotted for various cars from these records, as a rule, show good at 10 miles, a slight drop in consumption at 15 and 20 miles an hour, a slight increase at 25 and 30 and with a decided increase as greater speeds are attained.



General Motors huge 1,268 acre proving ground near Detroit is shown in accompanying illustration. 1, garages; 2, living quarters; 3, office and auditorium; 4, photographic screen; 5, gate house; 6, weather observatory; 7, director's residence.

How Quick Do Brakes Act?

BRAKING is a most important function in automobile design, and the General Motors engineers demand that their cars not only stop quickly but also without an undue amount of pedal pressure. To test these factors they have developed the *decelerometer* which registers not only the distance required to stop at certain speeds, but the number of pounds pressure used on the brake pedal.

The *decelerometer* consists of a box containing an electric motor which actuates a recording paper, an inverted pendulum supported by a spring steel band and a tube connecting the box with a depressing pedal fitted over the brake pedal. When the brake is applied the pressure is recorded through hydraulic power to a hand situated over the recording paper where the exact pounds pressure is marked. At the same instant the recording paper is moved forward by the motor and the pendulum, actuated by the retarded momentum of the car, moves the other hand across the moving recording paper and plots a deceleration curve of feet per second (or the deceleration squared).

Will the Motor Run Cool?

IF there was a hill 1,000 miles long, would the Viking climb it without overheating? At such a query the engineers hitch up the towing *dynamometer* and give a demonstration of how they can test the cooling system of an automobile without going near a hill.

The towing dynamometer is a truck coupled to the rear of the car being tested by means of a draw bar which actuates a dial in the driver's compartment. There is a large electric dynamo under the driver's seat which is connected with four banks of resistance coils, controlled by a rheostat located on the driver's seat and connected with a dual remote control in the car being tested. When the towing dynamometer is operating the generator excites its own field and the resistance created, together with the pull of the truck, is measured on the dial. In this way a car can be held, through manipulation of the rheostat, to any desired pull as long as needed. The driving compartments of both towing dynamometer, and the car being tested, are connected by telephone so that the drivers can properly co-operate in the test work.

Measuring Noise Inside Car

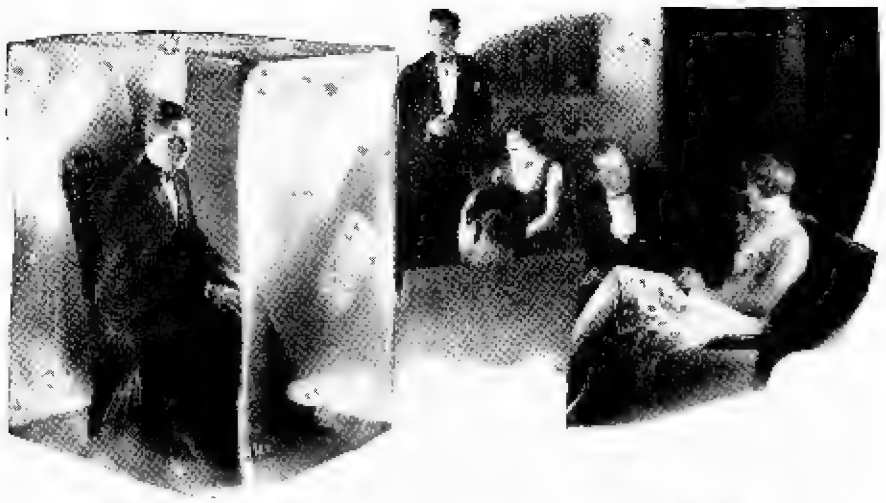
THE radio has been called into play to "measure" the noise in the interior of a car when it is being operated at various speeds. The mechanism consists of two boxes somewhat similar in appearance to radio receiving sets of several years ago. One box contains a loud speaker apparatus which magnifies all sounds inside the car and transmits them to an ear phone connected with the left ear of the tester. The right ear phone is connected to the other box in which noise is created and controlled by turning a dial. When the noise striking both ears reaches an equal intensity, the reading of the dial on the second box gives the relative noise created by the car when driven at that specified speed. While this test does not give an exact measurement of sound, it does, by comparison, give the relative quietness of all cars when one is compared with another.

Now that we have found out just how much noise there is in a car, the question is what part of it is due to body and frame design? And, can it be removed? The answer was to drive the Viking on the torsional oscillator, a machine which, at first glance, resembles the raised metal runway of a modern auto washing rack. It is raised about 20 inches from the floor with separate depressions for each of the four wheels of the car to rest into. These wheel rests are connected with a lifting mechanism controlled by hydraulics.

When the machine is started, first one wheel rest after the other is raised and lowered. The result is that the entire frame and body of the car is kept under a continuous twisting strain which the worst road in the world could not duplicate in actual driving.

Every squeak and rattle that the car can be made to produce are heard as the machine operates. Due to the slow and continuous movement, mechanics can locate each sound and see if it can be eliminated. In this way the noises are located and methods taken to eliminate them. Engine and operating noises are tested in equally scientific ways in the laboratories.

Many motorists have stopped their car with one or two wheels in a ditch or deep hole and have found that some or all of the car doors either would not open, or



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I HAD always been painfully bashful. When trying to carry on even the most commonplace conversation my voice would sound unnatural and my hands and knees would tremble. Often I would listen to an argument among a group and become so keenly interested that I would want to voice my own opinion—yet timidity would keep me silent. I never had the courage to stand up for what I knew to be my rights—I was always afraid of "what people will say," of ridicule. Since my childhood I had had a secret desire to appear in public—to be active in politics—but my shyness was so great that I turned to ice when I tried to talk—in even the smallest gathering!

My inability to talk was also affecting my business success. I dreaded going in and asking for a raise—I was afraid of any situation that meant using my voice—having to express myself. I didn't know how to present the ideas which I was sure the firm could use. I was just a plodder—a truck horse, capable of doing a lot of heavy work, but of no use where brilliant performance was required. Often I would see men who were not half so thorough nor so hard working as I, promoted to positions where they made a brilliant showing—not through hard work, but through their ability to talk cleverly and convincingly—to give the appearance of being efficient and skillful.

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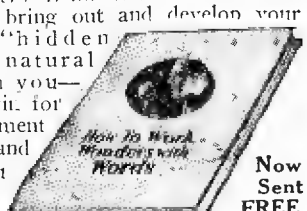

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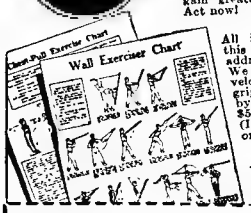

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if they did open, could not be closed. This is due to frame distortion which throws the body out of line.

The Frame Distorter

AT the proving ground they have a *frame distorter* consisting of a single track which raises at a sharp angle. One front wheel of the Viking was driven up this track until the center of the hub was 38½ inches above the ground while the other three wheels rested on the pavement. Then every door was opened and closed. This was made possible by the design of the car, repeatedly tested on the distorter, which allows the greater part of the frame distortion to be taken up by the springs instead of by weaving the frame.

Giving Springs the Third Degree

SPEAKING of springs, they have a natural spring hazard at the proving ground. It is a stretch of road consisting of a series of uneven bumps. Driving over this road at 20 miles an hour or better, *the rear wheels are in the air most of the time!* If there is a weakness in the springs, this trip over the bumps brings it to light.

These bumps have been designed as scientifically as any of the test devices just described. At the start the ridges are wide and wavy. Gradually the bumps increase in number with the spaces between growing narrower. With the road constructed in this manner there is a point somewhere in its length where the vibration caused by the bumps reaches the same frequency of the natural vibration of chassis and springs—and when these two vibrations are thus synchronized there is a real test of chassis and spring strength. Facts were wanted regarding how much effort is required to turn the steering wheel when the car is standing still and moving at various speeds. So they devised another test machine.

This is a secondary steering wheel fitted above the regular wheel of the car. It is equipped with two lugs which actuate the steering wheel when the secondary wheel is turned. The lugs are fitted into cylinders and automatically register the exact power exerted to turn the car.

In addition to all these mechanical marvels which bare the innermost secrets of car construction, the proving ground is honeycombed with roads of every description which have been constructed with the same accurate attention to obtaining facts as have the testing devices. Exact distances and grade percentages have been surveyed and plainly marked.

These roads consist of two concrete straightaways, one running east and west and the other north and south; the mammoth speed track with turns so banked that the sky is the limit on speed; concrete hills of varying degrees of steepness, unimproved dirt roads, brick pavements and gravel highways. The steepest grade registers a maximum of 25 per cent. In this connection it might be stated that public highways rarely exceed 7 per cent.

Oh! Those Hills!

HILL climbing tests are as accurate as it is humanly possible to devise. The car being tested is first warmed up to efficient operating temperature. Then it is driven at a predetermined speed (usually five or ten miles an hour) to the first marker on one of the hills; the accelerator pedal is pressed to the floor boards and the driver, by means of the road markings, registers the exact distance the car climbs in high gear and the amount of load carried.

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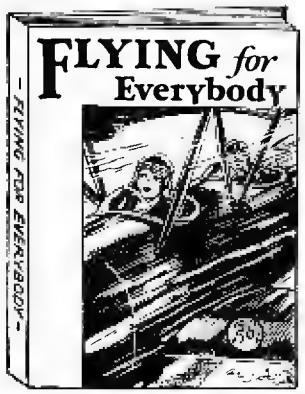

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Ice Sports

(*Continued from page* 908)

Flat-Iron "Curling" By Flood-light

The headlights are wired in parallel and one strand of the wire is opened and connected to a switch fastened to one side of one of the braces. The foundation consists of a frame made of two pieces of 2" x 4", 5 feet long, spread parallel, 4 feet apart for the runners, and which form a rectangle by two cross planks 4 feet long by 6 inches wide, spiked to each end as shown. A third piece of 2" x 8" is then mortised in the center between the cross planks to form the battery platform and runs parallel to the runners.

"Curling" is played on a smooth expanse of ice with three or four old-fashioned flat-irons. Lay out a circle on the ice 4 feet in diameter, then lay out another 50 feet in diameter outside of the first circle. The object of the game is to stand outside the larger circle and slide the flat-iron into the small circle. Each contestant throws three or four, and the tally counted before his opponent tries his luck. Each iron within the small circle counts 5 points and each one stopping on or touching the line counts 1 point. The first person reaching a hundred wins.—*Dale R. Van Horn.*

Skating Down Hill

(*Continued from page* 909)

of two pieces. The runner blocks are of 2 x 4, placed on edge, and are 1 ft. long.

Fasten the C pieces together with screws to make a rigid backbone of double thickness. Then, keeping it on a level foundation, spread one A section each side of the front end, bolt them to C at about the angle shown and bevel off the bottom end of A so it is level. Now spring the top ends of A together and fasten them so temporarily. This makes a sort of fork of AA, with the tops together and the bottom ends spread apart.

Now bolt the top ends of B sections each side of A to form a wide angle and bolt the bottom ends outside the end of the rear of section C and level off the bottom end of B the same as you did that of A. This forms a wide triangle with the point of A and B about the same height above ground as the handle bars of a bicycle. Round off the peak of the triangle and bore a hole through it, through which drive a piece of ½-inch pipe 18 in. long with a handle bar grip on each end. These are the handle bars of your scooter.

Between the sections of B and through the rear end of C bore a hole slanting backwards somewhat for the seat post of a bicycle seat as shown. A piece of steel screwed to the bottom of C acts as a retaining plate of the post. Then directly below the handle bar bore a hole in C for the foot-rest, consisting of a short piece of pipe driven through it as shown.

Bolt a runner block inside the bottom ends of A and B, so they will swing loosely, and to the bottom of the blocks bolt a pair of old skates well sharpened.

How To Build a Pushskater

(*Continued from page* 909)

With the exception of a small bit of blacksmithing, it can be constructed by anyone capable of handling ordinary tools.

The backbone consists of a clear-grained plank 10 ft. long by 12 in. wide and 2 in. thick, pointed at one end for the bow. About 2 ft. back from the bow bolt a runner plank of the same width, but 4 ft. long

(*Continued on page* 948)

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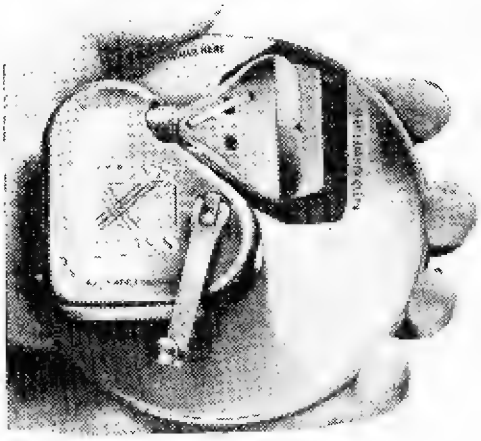

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By Harry F. Tapp

(*Continued from page* 899)

thoroughly clean the boiler or furnace flues and remove the grates. If necessary, a refractory combustion chamber or hearth is constructed and made ready for the burner.

In some localities it is possible to use an entirely different circuit from the house wiring with a separate meter and obtain a power rate which is somewhat lower than that charged for lighting service.

After running the wiring to the master control panel, the boiler control is installed on the boiler and the thermostat is located. The thermostat is responsible for the maintenance of a uniform temperature and is a mechanically accurate unit that functions according to the temperature condition of its location. Therefore, it is important that it be located with care. It should be on an inside wall about five feet from the floor, at the breathing level, protected from abnormal drafts from stairways or entrances. It should not be placed near a chimney, radiators, registers, hot water or steam pipes, or other sources of heat. Particular care should be taken to avoid concealed steam or hot water pipes.

The wires from the thermostat and the boiler control are connected through a junction block to the control panel of the burner which is now ready to be set for operation. The burner is correctly levelled and set, electric connections made and checked and the oil line connected. After a thorough check by the inspector the tank is filled with oil and power is thrown on, starting the burner.

Next the oil and air proportions are adjusted for efficient combustion and each individual control and unit of the burner is tested, to make sure it is correctly adjusted and working properly.

After painting the pipes and boiler, patching the floor and walls where it has been necessary to cut thru for piping and wiring, all tools and materials are removed, the basement cleaned up and your installation is ready for service.

In order to obtain the most satisfying results from your oil heating equipment you should take note of the following essential points.

1. Oil heating equipment functions only to provide heat. It will not take care of the water level in the boiler. It will not operate when the current is shut off, nor when the fuel oil is exhausted. The entire plant should have regular inspection to see that these conditions are correct.

2. Oil burners are machines requiring reasonable care, oiling of moving parts and occasional cleaning. In this respect they are like clocks, automobiles, fans and electric refrigerators.

3. Oil burners are subject to adjustment like all other machines, and operate best when perfectly adjusted. Expert service men can make the occasional adjustments far better than a layman or ordinary mechanician.

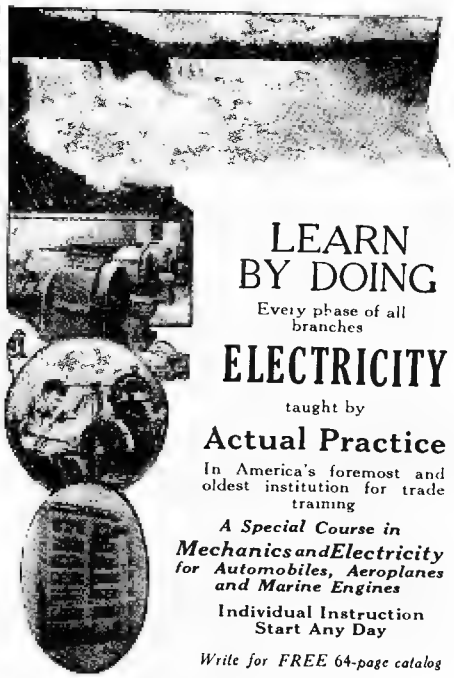
4. Once the correct adjustments are made, they can be disturbed only by the following methods:

(a) Manually, as when someone attempts to interfere with the automatic operation of the burner, or to adjust the parts. Leave the apparatus alone, except for regular inspection, oiling and cleaning.

(b) By changes in fuel. Stick to the same grade and quality of fuel, or have a service man readjust the burner when changes are necessary.

(c) By presence of foreign matter, particularly in fuel.

(d) By natural wear. Periodic inspections will take care of these changes.



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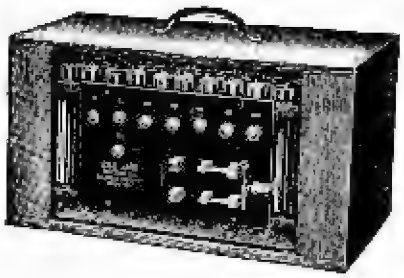

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Modern Artistic Wall Finishes

By Joseph H. Kraus

(*Continued from page* 903)

These products are not paint or plaster. They can be applied to ordinary walls at a thickness of a sixteenth to an eighth of an inch. They can be troweled like smooth plaster or can be raised in ridges producing very beautiful effects in imitation of stone, either antique or modern, in scroll textures and in stipples. The surface can be painted or colored and in the case of Textone can be blown with colored sand. When the tinted sand is blown into the wet surface, the color is permanently fashioned into the wall."

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"But Bill," interjected Harry, "the properties are very fine of every one of the products you outline, and after all, I have walls on my house and your house is still in the process of preparation. Just what are you going to do?"

"I'll tell you, Harry, frankly I think I'm going to do one room with one product and another with the second. I like the color effects obtainable with Vitrolite. My wife likes tile, only because she once lived in a place that had tile. I think, from an economical standpoint, Porstalaine will answer in one of my rooms. But frankly I intend to test out the products to set my own mind at ease, every one of them; not only the wall board finishes of the various kinds I have gone over, but also the plastic materials that can be applied to those walls. Will you do likewise?"

The Safety Valve

(*Continued from page* 919)

figure by π and we get a diameter of 42,016,940.4664 ft. To this we add the 12 ft., namely 6 ft. on either side the newly increased diameter. We multiply this by π again and we get 132,000,037.698917576 or an increase in the circumferential footage of 37.698917576 ft.

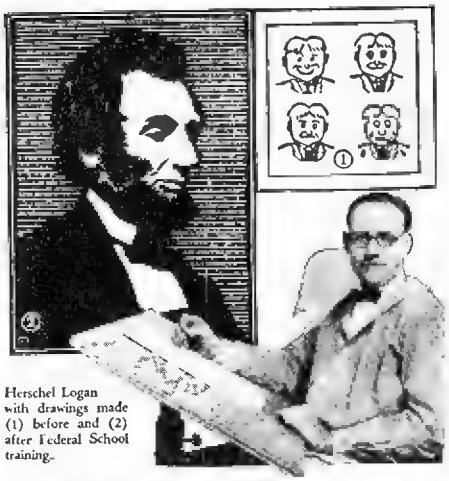
We hope that SCIENCE AND INVENTION Magazine will continue to interest both daughter and wife for a great many more years. You had better lock up your copies or order two of each number. Good way to increase circulation, eh, what?—EDITOR.)

The Art of Make-Up

(*Continued from page* 895)

of German actors are proving themselves adept at rôles calling for characterization parts. Among these may be mentioned Emil Jannings who, although he is now starring in our own productions, first learned the "tricks of the trade" in foreign productions, and Paul Muni who, in a very recent production — "Seven Faces" — achieves what has never before been attempted on the screen in his portrayal of seven distinct rôles. Muni's achievement is not one of make-up only, but also involves complete transformation of facial expression and tonal qualities.

Even if this new Berlin school should not produce any such geniuses, it will undoubtedly do much toward the advancement of this art of make-up and characterization.



Herschel Logan with drawings made (1) before and (2) after Federal School training.

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HERSCHEL LOGAN'S first drawings (1) were very poor. But he was determined to succeed. Obtaining a beginner's position in a publishing house, he studied his Federal Course at night. Today his drawings are seen in National Exhibits. Recently he made $100.00 over his regular monthly salary. Do you like to draw? Logan did, so he answered an ad like this. Now compare his recent drawing (2) with the small, crudely drawn heads he made before he took the Federal Course. Then follow his example and develop your talent.

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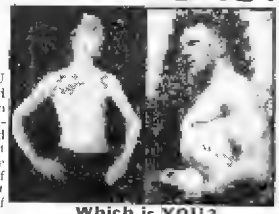

Which is YOU?

Look at those two pictures! Which is YOU? A puny, run-down weakling, scorned by your fellow-men, avoided by the girls, ashamed to show yourself in a bathing suit? Snap out of it friend. Take a look at that big boy at the right and cheer up. That's the way TITUS builds men. And YOU'RE NEXT.

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How to Build a Pushskater

(*Continued from page* 945)

at exactly right angles under the backbone. Under each end of this bolt a pair of 2 x 4 blocks, parallel to each other and parallel with the backbone and 2 in. apart. Slightly back of the center of the backbone bolt a triangular block with a flat top for the seat, which consists of a rectangular piece of 2-in. plank of sufficient size. Now in front of this seat bolt a second triangular block (pillow block) with a level flat top and an opening 6 in. long in the bottom for the propelling levers. Directly in the center of the bottom opening bolt a steering lever to the backbone. This can be an oak bar about 2 ft. long with indentations for the feet as suggested. It must swing loosely on the bolt and have a hole in each end.

The propelling levers are as shown about 2 feet long with handles shaped at the upper ends. Pivot them with a single bolt to the top of the block and 4 inches below the pivot bore a second hole for the connecting rod bolt.

Now have a piece of ¼-inch flat steel (or wrought iron) 3 in. wide, bent in the form of a U, with the flat part about 14 in. long and the uprights 8 in. high. Drill several bolt holes in the flat and a ½-in. hole in the uprights 2 in. from the top. Saw the latter down into a slot. Then arrange a steel cleat to pivot at one side and clamp in place with a set screw to close the slot as shown. Bolt this, which is the crankshaft support, across the backbone a foot from the rear end and across its length.

The driving device consists of two old motorcycle wheels, with the tires removed and bolts inserted through the rim about 4 in. apart all around. These are inserted from below and locked on with a nut. Then they must all be filed down to a point so they project about one inch from the rim. Mount them on a crankshaft made of ½-inch round steel and fashioned as indicated in the detail sketch with a double throw of 4 in. each. Any good blacksmith can fashion this for you at a nominal charge. The length must be sufficient so the wheels will clear the backbone edges by at least 2 inches. Set the crankshaft in the slots in the U steel and then close down on the cleats, filing them if necessary to fit the top of the shaft to make a good bearing. A little oil on each bearing will make the shaft quite smooth running.

The connecting rods are pieces of oak 1½ in. by ¾ in., bolted loosely to the bottom ends of the propelling lever and then fitted over the crankshaft throws by means of the slots indicated in detail. Take up on the rear end screws just enough to make a running fit and then apply grease to eliminate wear.

There are three runners, two forward and one acting as a rudder. They consist of an oak block 15 in. long by 6 in. wide and 2 in. thick, shod with half-round iron. A bolt hole is bored near the top edge just back of the center. Two of them are pivot bolted between the blocks on the runner plank previously described. The rudder is inserted in a 2-in. slot in a block 4 in. wide and bolted in a similar manner. This block is then furnished with a vertical bolt acting as a rudder post. Its top end is squared and fitted with a tiller cut from sheet steel, after being inserted in a rudder post hole bored through the backbone just aft of the crankshaft support. The tiller is shown in the plan view and has a hole in each end.

Paint the entire affair with any desired color of weatherproof paint, grease and oil all bearings and you are ready for the trial trip.—*L. B. Robbins.*

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Let's Go Ski-Planing

By Dr. T. O'Conor Sloane

(Continued from page 878)

when one is interested in making the longest possible glider flights. In the first place, when the skier comes down the chute on either side on his skis, he will leave the slope or slide with a very high velocity and the general idea of this new idea in winter sports is to provide a light pair of wings, as it were, which will help to give him greater sailing power through the air and increase the jumping distance. For a simple glider such as that described in the August issue, the wings are made very simply of a few light wood ribs and then covered with some light cloth which is given a few coats of airplane dope.

In the tail-less type of glider here shown particularly, and for the purpose of ski-planing, only two motions of the control stick mounted in front of the pilot are suggested. The stick in this case controls the right and left ailerons, which members are pivoted and provided with horns on top and bottom. One of the diagrams shown here illustrates how the control cables are fastened to the control stick and the ailerons, in such a manner that if the left wing should be low, the natural action of the pilot will be to push the joy-stick to the right, which will pull the left aileron downward and cause the reacting air stream to push the left wing upward. The belt in which the pilot sits may be provided with a couple of leather straps, through which the legs are passed when getting into the supporting frame or belt; the belt itself may be made of metal, wood or other material. It should be of some rigid material so as to hold the four struts in accurate and stable alignment. In the full-size German tail-less glider shown in the photograph accompanying this article, it will be observed that the rear halves of the two vertical stabilizing fins at the outer ends of the two wings, are pivoted also and these are controlled by the pilot to help in steering the craft. If a small ski-plane is built, with the wings about 10 to 12 feet long, or a 20 foot span over-all then by utilizing the action of the legs and also learning how to use the aileron control skillfully, the forward direction of the ski-plane can be pretty well controlled. The skier will come down the chute or natural snow-covered incline with great rapidity and it is considered that not much steering direction will be necessary so far as complicated controls are concerned, as his natural velocity will carry him to his destination in a general forward direction without any great difficulty, unless a very strong wind is blowing from one side. The two-way control suggested makes for simplicity and more people can enjoy the thrill of ski-planing than would be the case where they had to learn the four or more control movements of the standard glider or airplane.

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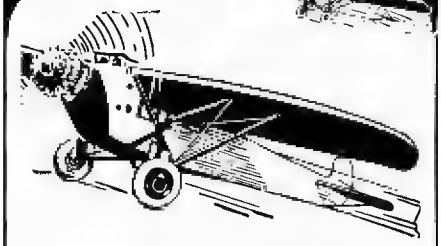

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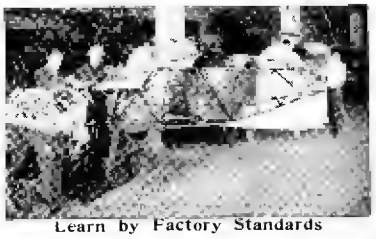

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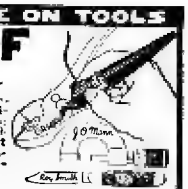

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Nicotine—Methane—Phenol

By Louis Oberseider

(*Continued from page* 905)

grams of sodium hydroxide in the least possible amount of water necessary and add 11 grams of acetic acid. Evaporate to small volume, and set aside until sodium acetate completely crystallizes out. Heat cautiously the crystalline salt in an iron pan over a small flame. Stir continuously with a glass rod. The salt melts at first in its water of crystallization; as dehydration proceeds it solidifies, and finally, when anhydrous, it melts a second time. Care should be taken to avoid heating the dehydrated salt much above its melting point, as it undergoes decomposition when strongly heated. Grind and mix thoroughly in a mortar the fused sodium acetate and an intimate mixture of 4 grams of powdered sodium hydroxide and 4 grams of quicklime. Transfer the mixture to a large test tube provided with a rubber stopper fitted with a short piece of glass tubing. Connect to the latter by means of a short piece of rubber tubing a delivery tube arranged to collect the gas over water. Clamp the test tube so that the end containing the stopper is slightly lower than the other end; this prevents water given off during the heating from running back into the hot tube and cracking it. Heat the tube, keeping the flame in motion to avoid local overheating. Collect several bottles of the gas to experiment with.

(1) Drop a burning splint into a jar of the gas and notice that no soot is produced. Methane is a saturated hydrocarbon.

(2) Light a mixture of methane and air.

(3) Add a drop of bromine by means of a pipette to a bottle of the gas, cover and allow to stand until bromine is vaporized. Drop a burning splint into the bottle and when reaction is complete, breathe sharply across the mouth of the bottle and test gases in bottle with moist blue litmus paper. Hydrobromic acid was formed.

In RADIO NEWS for February, 1930

Carl Dreher, formerly Chief Engineer of R. C. A. Photophone, Inc., and now Chief Sound Engineer for RKO Pictures at Hollywood, tells how the "mike" and its attendant speech amplifier apparatus has put life in the movies.

Lieut Wm. H. Wenstrom outlines, in another of his informative articles on short waves, the phenomena of short-wave transmission in simple, non-technical terms and analogies.

Benjamin F. Miessner, inventor of note and authority on a. c. operation of receivers, tells in a humorous vein the trials and tribulations encountered in tracking down the elusive hum.

Two articles on auto-radio receivers, one by McMurdo Silver, the other by Stuart C. Mahanay, keep you advised of the developments in this new radio activity.

Three new services for the serviceman and experimenter make their debut in the February RADIO NEWS. They are "Radio News Manufactured Receiver Circuits," "Radio News Home Laboratory Experimenter Sheets" and "Radio News Information Sheets."

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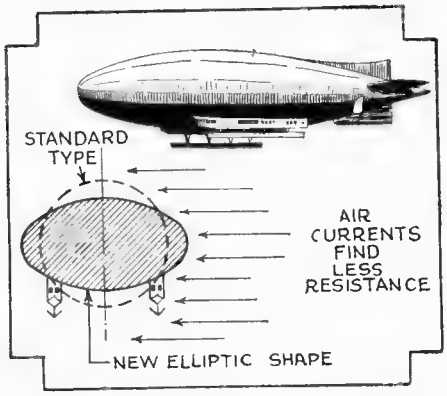
Dirigibles or Planes?

By Augustus Post

(*Continued from page 876*)

the rate of speed. When an airplane operates over a range of more than five hundred miles (without stopping, of course) the fuel that must be carried reduces the paying load, and so the fare must be raised beyond the point where it becomes an attractive proposition, except in cases of emergency.

A few days ago Glenn Curtiss told me that it was his opinion that we may look for the greatest relative advance over present day methods of travel in oversea transportation. This is proved by the fact that the trend in Europe is for the building of very large flying boats to compete with the comparatively slow steamers, and the fact that a large flying boat becomes more seaworthy and can land on the ocean at practically any moment, except in the severest weather—from whose effects it is becoming more and more possible to escape by the complete weather reports and the speed at which it is possible to run away from storms. If a storm goes sixty to seventy miles an hour, an airplane that makes even as low as one hundred miles an hour could run ahead or go to one side or the other of the disturbance.



One of the newest proposed designs for building airships of elliptic cross-section, so as to minimize the effect of high winds is shown in the diagram above; the design of cabins and pontoons is such that the airship can land on the water safely.

In ocean transport the airship has a natural advantage in its far greater range of action. Commander Burney says that "Taking the most optimistic view of technical developments in ten years' time, it is possible that we shall have airships capable of a range of seven thousand miles, carrying fifty tons of pay load at a speed of 100 miles an hour," and though for practical purposes it may be said that the commercial range of any aircraft cannot exceed fifty per cent of its designed range, and that under these conditions the nominal available pay load will not exceed fifty per cent of the designed pay load, this brings a reasonable expectation—in the light of present performances—to the considerable figure of three thousand miles for the airship at a 100 miles per hour cruising speed, which is three times the range that may in like manner be expected for the flying boat.

Commander Sidney Rosendahl, commanding officer of the "Los Angeles," says that the rigid airship will be equal to all but the most severe weather conditions, which it will avoid, and its particular field will be transoceanic, while American airships will have the added advantage of the use of the non-inflammable gas, helium,

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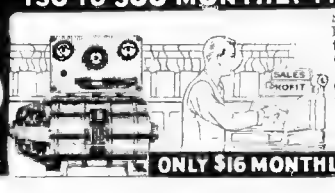

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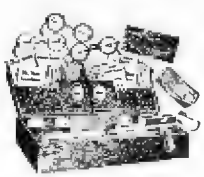

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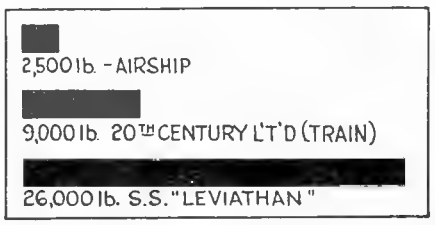
for inflation, seeing that we have a virtual monopoly of the helium supply. The transoceanic airship is, in general, much more comfortable than the airplane, and will undoubtedly increase in comfort, as the great increase in each successive model clearly indicates. There will always be more room in an airship than an airplane can afford to give to comfort alone.

Captain L. M. Woolson, research engineer of the Packard Motor Co., said recently that if Lindbergh on his first world-famous flight from New York to Paris, had used a Diesel engine he could have carried three passengers instead of going solo. But it will be some time before the smoking room and lounge of an airplane is large enough for a considerable company to have as much elbow-room as it now has on one of the great transoceanic airships. Dr. Hugo Eckener, when the flying population of the DO-X was announced, said that he could carry seven hundred passengers in his airship a distance of from 500 to 1000 miles, if he could stow them away *anywhere!*

The greatest handicap to airship effectiveness is its dependence on fixed bases with mooring masts and ground crews; in short, the problem of the dirigible, like that of any form of transport, is closely concerned with terminal facilities. On the study of this problem the minds of all constructors and engineers are bent. Commander Burney's suggestion is for a structure that he calls a "Land Docking Raft," a telescopic mooring mast mounted at one end of a long platform, pivoted to one end of a rail track leading to the hangar. On either side of this platform are folding vertical arms that can be placed in position alongside the airship's hull to hold it firmly; the whole structure, with the mooring mast, can then be rotated like a turntable until it points to the hangar and runs along rails into the shed. He also has worked out an elaborate plan for an elliptical shaped airship to land on water. (*See page 951*)



Very interesting graphic comparison of the weight of carrier required per passenger, showing that the airship has the least weight per passenger, of any of the common carriers.

There is no antagonism between the airplane and the airship. They are complementary, each to the other. If long-distance routes are established—as they are constantly being planned, all over the world—the large airship will no doubt supplant the airplane there, especially on flights across oceans, but in the operation of such long-distance routes the airplane is quite necessary for the linking-up of intermediary ports-of-call. The operation of "feeder" lines radiating to and from airship call centres devolves solely upon heavier-than-air craft. "Thus will the two types of aircraft," says the editor of *Airways*, "each suited for a specific task, be dependent upon each other, and instead of ousting the airplane from its sphere, the coming of the airship will, in fact, provide greater scope for its activities than at present exist."

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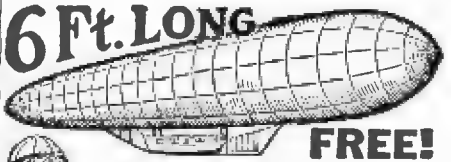

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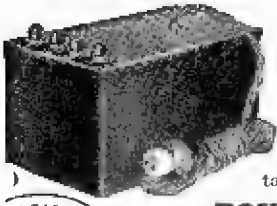

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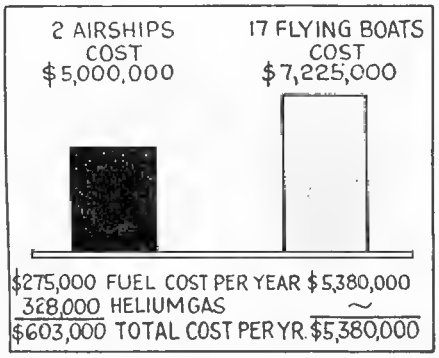
his expert opinion that airplanes two to three times as large as the huge Dornier DO-X, which flew with 169 passengers over Lake Constance, *are not only feasible but structurally less difficult than the transport airplanes now being built.*

"It will be easier to build a larger boat than it was to construct the DO-X. It is exactly like building a steel steamship. As the size is increased the sheathing of the flying boat is made thicker and weight-saving becomes simpler, relatively speaking. For instance, in the DO-X we used nine rivets to every two pounds of spar weight, compared with forty-four rivets for every two pounds of spar weight in the two-engined Dornier Wal."


2 AIRSHIPS COST $5,000,000
17 FLYING BOATS COST $7,225,000
$275,000 FUEL COST PER YEAR $5,380,000
328,000 HELIUM GAS
$603,000 TOTAL COST PER YR. $5,380,000

This graphic chart shows comparison of initial cost for aircraft to carry approximately 3,000,000 pounds per annum across the Pacific from 'Frisco to Honolulu.

Dr. Dornier has already laid down on the drawing board designs for a flying boat which will have a gross weight of 80 tons compared to the gross weight of 52 tons of the DO-X. He plans to power the huge projected ship with nine engines of 1000 horse-power each, developing 9000 horse-power compared with the 6000 horse power of the DO-X.

The limiting factor in the creation of large airplanes right now is the factor of power. We want a satisfactory motor developing a thousand horse-power. We will get it eventually. The DO-X will probably fly to America next summer, by way of South America.

America with its large cities, conveniently located on fine waterways, offers the best field for the large flying boat. A ship of the size of the DO-X could be used to advantage between New York and Miami Beach, between the great cities of the Great Lakes region, and along America's large inland waterways.

Economy

THE economy of airship service commends itself to commercial enterprise. Think of a fuel cost per passenger for the crossing the Atlantic in an airship, of but twenty dollars, and a fuel cost per passenger for flying from New York to Chicago of only five dollars. The modern airship has a range of operation at the present moment wider than the width of either the Atlantic or the Pacific.

Mr. Carl B. Fritsche*, a well-known authority on lighter-than-air craft, gives the relative figures of a fifty-seven ton flying boat and a seventy-five ton airship on a mail route between California and Hawaii, an estimated distance of 2540 statute miles:—

*Note: Paper presented at the third meeting of th Aeronautical Division of the American Society of Mechanical Engineers. St. Louis, Mo., May 27, 1929.

EARLE LIEDERMAN, the Muscle Builder
Author of "Muscle Building," "Science of Wrestling," "Secrets of Strength," "Here's Health," "Endurance," etc.

The Man I Pity Most

POOR OLD JONES. No one had any use for him No one respected him. Across his face I read one harsh word FAILURE He just lived on. A poor, worn-out imitation of a man, doing his sorry best to get on in the world. If he had realized just one thing, he could have made good. He might have been a brilliant success.

There are thousands of men like Jones. They, too, could be happy, successful, respected and loved. But they can't seem to realize the one big fact- that practically everything worth while living for depends upon STRENGTH —upon live, red-blooded he-man muscle.

Everything you do depends upon strength. No matter what your occupation you need the health, vitality and clear thinking only big, strong, virile muscles can give you. When you are ill, the strength in those big muscles pulls you through. At the office, in the farm fields, or on the tennis courts, you'll find your success generally depends upon your muscular development.

Here's a Short Cut to Strength and Success

"But," you say, "it takes years to build my body up to the point where it will equal those of athletic champions." It does if you go about it without any system, **but there's a scientific short cut.** And that's where I come in.

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I Strengthen Those Inner Organs, Too

But I'm not through with you. I want ninety days in all to do the job right, and then all I ask is that you look yourself over

What a marvelous change! Those great squared shoulders! That pair of huge, lithe arms! Those firm, shapely legs! You'll be just as fit inside as you are out, too, because I work on your heart, your liver—all of your inner organs, strengthening and exercising them. Yes, indeed, life can give you a greater thrill than you ever dreamed. But, remember, the only sure road to health, strength and happiness **always demands action. Start now!**

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It contains forty-eight full-page photographs of myself and some of the many prize-winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you It will thrill you through and through. This will not obligate you at all, but for the sake of your future health and happiness do not put it off. Send today —right now before you turn this page.

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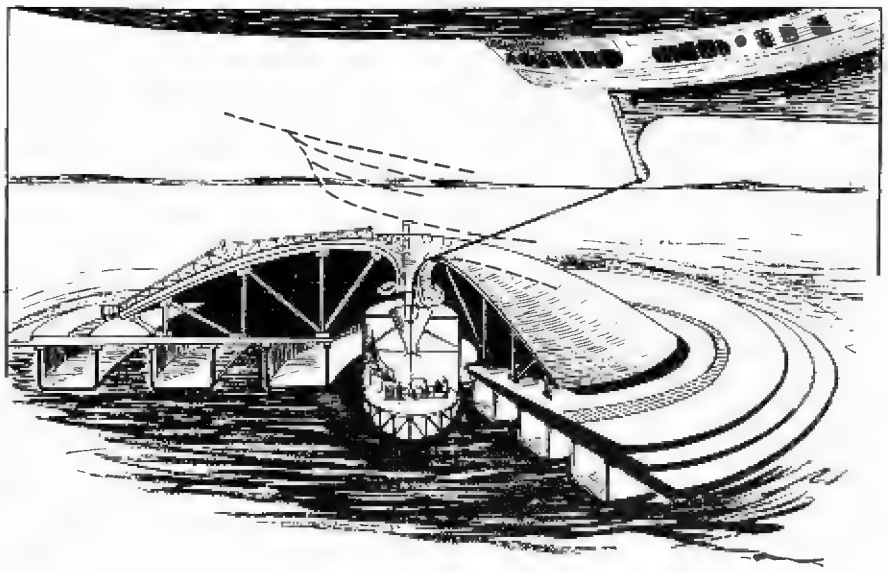
Airship More Economical

FOR example, let us compare the performance of a 57-ton flying boat with that of a 75-ton airship on a mail route between a California port and Hawaii, a distance of 2540 statute miles. In the light of present development, the flying boat would be able to transport about 1,000 pounds of mail while the airship could transport 14,000 pounds. The engine equipment required for the flying boat would be 6,000 H.P. and for the airship 4,000 H.P. Flying non-stop in still air, the fuel cost per pound of mail transported in the flying boat would be about $1.85 while in the airship it would be only ten cents for the entire distance. Amazing? Not at all when further examination reveals that the pay load in the flying boat is only 2 2-3 ounces for each horse-power, as compared to 3½ pounds in the airship. Then why this enormous advantage in favor of the airship?

Because, searching investigation by leading scientists and qualified engineers proves conclusively that there are inherent limitations in the performance of heavier-than-air craft; it is a matter of common knowledge in engineering circles that the efficiency of an airship increases very rapidly with increase in volume, while in heavier-than-air craft (planes) there is little increase in efficiency with size, and in extremely larger sizes there may even be an actual decrease!



Cross-section of water landing station for dirigibles—see picture start of this article.

Fuel Cost Low

IT is realized that the cost of fuel represents in itself only a small portion of the cost of operation. However, for the purpose of simple comparison, fuel cost is a vital consideration for the reason that it is a direct index of the cost of power plant operation, maintenance, replacement and depreciation which collectively, in long range transport, represent at least 50 per cent of all operation charges.

The 75-ton airship used in our comparison will have a displacement of only 2,500,000 cubic feet, which is small as airships go. On the other hand the 57-ton flying boat, according to some authorities, seems to approach the economic limit in size with little hope for improvement in performance except by resorting to the very questionable expedient of increasing the wing loading per unit of area, which in turn increases the landing speed and thereby reduces the operating safety factor.

The estimated capital investment required for the building of two metal-clad airships for the California-Hawaii route is set forth in table No. 1 herewith. It is suggested that each airship would make one round trip per week. With a pay load of 14,000 lbs. these two ships would transport 1,456 tons or 2,912,000 lbs., of pay cargo per annum.

Inasmuch as these ships would be inflated with helium, it is interesting and important to investigate the annual operating cost of helium for two ships flying on a schedule of one round trip per week each. Based on a cost of $40 per 1,000 cubic feet it amounts to about $328,000. Surprising as it may seem, this is only about $50,000 more than the annual cost of fuel.

TABLE NO. 1
CAPITAL INVESTMENT FOR AIRSHIP EQUIPMENT
CALIFORNIA-HAWAII ROUTE

2 metalclad airships (75 tons gross lift each) @ $2,500,000.00	$5,000,000.00
Spare parts, reserve engines, gas cells, helium, etc.	500,000.00
1 Hangar	1,750,000.00
2 mooring towers, fuel tanks and utilities	400,000.00
Helium purification plant and gasometers	400,000.00
Repair shops	150,000.00
Crews' quarters and miscellaneous buildings	200,000.00
2 terminal buildings and office equipment	250,000.00
Land	250,000.00
Electrical equipment, radio stations, etc.	200,000.00
Unforeseen items	900,000.00
Working capital	1,000,000.00
Total capital investment required	$11,000,000.00

The economy in airship operation can be emphasized in no better way than through comparing the operating cost of this size of ship with the largest flying boat in the world now under construction. It is being built in Germany.

57 Ton Flying Boat

THIS super-flying-boat will have a gross lift of 57 tons. It will be equipped with engines developing 6,000 horsepower, and its cruising speed is announced to be 115 m. p. h. Its useful load minus crew, according to its designer, is 56,815 lbs. Assuming that the entire useful load capacity would be available for fuel and pay cargo, let us endeavor to ascertain

how much pay load it would be able to transport on a route from California to Hawaii, a distance of 2,540 miles.

At a speed of 115 m. p. h. it will require twenty-two hours for this boat to negotiate the voyage in still air. 2,100 lbs. of fuel will be required per hour at cruising speed. Twenty-two hours' flying will require 46,200 lbs. Allowing for 20 mile head wind, which is the minimum allowance that it would be safe to consider, would require additional fuel of 9,615 lbs. Total fuel required—55,815 lbs. Subtracting this figure from a useful load of 56,815 lbs. would leave only 1,000 lbs. carrying capacity for pay load.

Assuming that each boat would make a round trip every four days, this would allow approximately 24 hours at the end of each voyage for adjustment and repairs. It would require 17 of these boats to transport the same weight of pay cargo per annum, that two 75-ton rigid airships, previously described, could transport.

Power Ratio—29 to 1

THE amount of power required to transport this pay cargo by flying boat is so extraordinarily large that it is ridiculous. Each boat is capable of carrying 1,000 lbs., pay load. Each boat is equipped with 6,000 horse-power. One horse-power is equivalent to 33,000 ft. lbs., of power per minute. Applying this formula to the flying boat and utilizing 70 per cent of its gross power at cruising speed, this means that for each minute approximately 138,000,000 foot pounds of power are developed. Inasmuch as the boat carries only 1,000 pounds pay load, it is a matter of simple arithmetic to determine that for each pound of pay load transported, 138,000 foot pounds of power are required each minute.

Contrast this with the small mechanical energy required for the operation of the rigid airship. Each airship carries 14,000 pounds pay cargo. It is equipped with 4,000 engine horse-power. At cruising speed, approximately 67,000,000 foot pounds of power are developed for each minute. Therefore, for each pound of pay load transported, only 4,800 foot pounds of power are required. The power ratio is almost 29 to 1 in favor of the airship.

In order to carry an actual pay load equivalent to that of the two 75-ton metal-clad airships, these seventeen 57-ton flying boats would have to make 2,912 trips one way per annum, as compared with only 204 trips negotiated by airship. The estimated capital investment for these flying boats, equipment, etc., is given in the table.

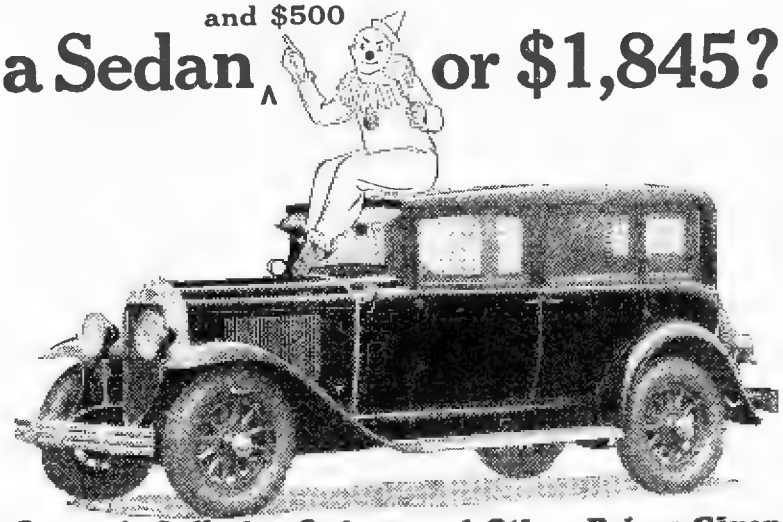
TABLE NO. 2

CAPITAL INVESTMENT FOR FLYING BOAT EQUIPMENT
CALIFORNIA-HAWAII ROUTE

17 Flying Boats (57 tons gross lift each) @ $425,000.00	$7,225,000.00
Spare parts, reserve engines, etc.	1,500,000.00
Hangars, dry docks and marine railways	600,000.00
2 Repair shops	225,000.00
Docking facilities, fuel tanks and utilities	500,000.00
2 Terminal buildings and office equipment	250,000.00
Crews' quarters and miscellaneous buildings	200,000.00
Land and harbor frontage	250,000.00
Electrical equipment, radio stations, etc.	200,000.00
Unforeseen items	1,050,000.00
Working capital	1,000,000.00
Total investment required	$13,000,000.00

The total estimated cost for carrying one pound of pay cargo in the *flying boat* from California to Hawaii is $8.34, while in the *airship* it is only $2.63.

Who Else Wants to Win a Sedan and $500 or $1,845?



Seven 6-Cylinder Sedans and Other Prizes Given

To advertise, we are giving a Nash Sedan, an Oldsmobile Sedan, a DeSoto Sedan, a Pontiac Sedan, an Essex Sedan, a Whippet Sedan, and a Chevrolet Sedan, all delivered through nearest dealers, not to cost you a cent. We even pay delivery charges—many other prizes, including radios and so forth. Mrs. D. H. Zifer, Lewis J. Link, Margaret Needham, Mrs. M. E. Meadow, Alvin Smith, Charles Francis, Viola Javins and numerous others won sedans through our last offers. Over 800 prizes awarded in one year through our unique advertising campaigns. Over $11,000.00 in prizes paid by us in one month. In next few months will award between 300 and 400 prizes through our offers. Here's the new one for you:

First Find the Twin Clowns!

The clowns in the border of this advertisement probably will all look exactly alike to you at first glance. But they are not all alike. Two—only two—are exactly alike. Can you find them? The difference may be in the color or markings in the hat, collar, nose, or top of the head. Find the twins. Look carefully. Be sure you have them—then answer at once. You may be the one who will solve this puzzle correctly and qualify for opportunity to

Win Nash Sedan or $1,845 Cash

Just think. There are seven sedans and many other prizes to be awarded in this offer, including valuable radios, and so forth, totaling over $7,300.00.* Duplicate prizes paid in case of ties. Surely you can win one of these wonderful prizes.

NO MORE PUZZLES TO SOLVE. No word lists to write or make up—no number puzzles to trace. We do this to advertise and expand our business. No cost or obligation. Nothing to buy now, later or ever.

Anyone who takes an active part in this offer and answers correctly will share in prizes or cash compensations.

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Be prompt. Immediately, without delay, if your answer is correct, I will send you a certificate which will be good for $500.00 if you are prompt and win first prize, and tell you why and how we make this unique advertising offer of free prizes. Just send the numbers of the twin clowns in a letter or on a post card. That's all. Send no money. All cars and other prizes are delivered at our expense, but be prompt.

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Get Yourself a Lucky Break!

DO YOU KNOW that if an obscure young Dane, living in Switzerland, hadn't fallen in love with a Swiss girl, you might not have had the radio? Do you know that if a heat wave had not swept over the United States, Calvin Coolidge might not have been President? That a sudden downpour of rain in Belgium one hundred and fifteen years ago was a direct cause of the Great World War? That if Alexander the Great hadn't got drunk on a "wild party" in Babylon, there would have been no Roman Empire?

Do you know that it's a hundred million to one chance that you were born? That nine men out of ten meet their wives by pure luck?

The great leaders of the world recognize and respect luck. More than that, they know how to take advantage of a lucky break. Do you? Let us help you.

Brief Stories Shows You How

In the February issue of Brief Stories Magazine, we have created a department called "LUCKY BREAKS" in which the great and near-great tell just how luck came their way, and how they recognized and took advantage of it.

Probably your lucky day is just around the corner. Will you recognize it, when it comes? Will you know what to do? Read "LUCKY BREAKS" in Brief Stories Magazine for February and be prepared. Invest a quarter in Brief Stories at your nearest newsstand, and you *may* lay the foundation for a million, two million, ten million—who knows how much? Maybe reading "LUCKY BREAKS" will be your Lucky Break.

"Lucky Breaks" is Just One Department in the New Brief Stories

Brief Stories Magazine also brings you a dozen or more corking good stories of adventure in strange far-off lands every month. Read "The Dead Carry On" wherein the shyest kid in the regiment runs berserk, after being given up as a "rotten" soldier. Read "The Silent Signal," a tale of the northern lakes in the dead of winter, where an airplane hunts a murderer. Read "Outcasts of the South Seas," by J. Allan Dunn, in which an earthquake takes a hand to perform justice, and the famous Devil's Island Prison loses two good men. Get them all in the February issue of Brief Stories, and settle down to several enjoyable, inexpensive evenings of choice reading entertainment.

See How It's Done in FEBRUARY

BRIEF STORIES

NOW ON SALE AT ALL NEWSSTANDS

How to Make a Perfect Cup of Coffee

By Mrs. Christine Frederick

(*Continued from page* 894)

the cloth filter should be boiled *every day* with baking soda, and renewed once a week. For the boiling method a pot made of a good grade of white enamel is best, as an aid in scrupulous cleanliness.

Grind your coffee at home. Choose the blend you like best—I cannot help you here, since tastes differ. If you buy it ground or pulverized, be sure it is kept in a tightly sealed container—or you will lose the precious aroma. For the percolator grind it only medium, but for drip process, the finer ground the better—but, remember, the more finely ground the quicker the aroma is lost. Here are brief directions for making the perfect cup of coffee by each of the three methods:

Boil Method

MEASURE out a heaping tablespoonful for every cup of coffee you want, and add as many cupfuls (half-pints) of *boiling* water as you have tablespoonfuls of coffee. Put the pot on fire and boil just exactly *three minutes*. Some people use crushed eggshell or white of egg to settle the coffee, but cold water added as soon as the three minutes are up will be quite as satisfactory (about a tablespoonful for each cup). Now shut the pot tightly, lest our precious aroma escape. Even stick a piece of clean cheesecloth or absorbent cotton into the spout; and serve as quickly as possible.

Percolator Method

DO not start with cold water. Get fresh boiling water and put it into the pot, using about the same quantity of finely ground coffee as in the boiling process. Be careful not to put over too hot a fire, (except if it is an electric pot) and let it take five minutes. Be very sure that the percolator is clean, and after the coffee is made, brush and clean the percolator thoroughly. Do not use complicated, hard-to-clean percolators.

Drip Method

A DRIP pot with a cheesecloth bag is the best, although the French pots and the filter paper pots are quite practical. You pour the boiling water slowly over the pulverized coffee, (which is the kind I prefer for this method.) Then you cover it and let it stand, preferably in a warm place, to drip a while.

The result from either of these three methods should be a clear, golden brown liquid with the genuine, unspoiled coffee aroma. It is at its best very hot or very cold, and when used with rich, fresh cream. If all the precautions are taken which I here outline, the result is certain to be coffee that is not only at its maximum of attractiveness, but also at its minimum of undesirable after effects. How some people can endure the effects of the boiled up wood fibre and acrid content with which the coffee bean is filled, is beyond my comprehension. The aroma is the real coffee, and that is gone after the first three minutes of boiling.

When Men Make Coffee

I BELIEVE everybody in this coffee-drinking land ought to learn early how to make a good cup of coffee. It is really very simple; but there are certain "don'ts" which cannot be neglected. *Men* as well as women should learn how to make good coffee. On camping trips or when left alone in the house they will find it a most valuable bit of knowledge. Many men nowadays pride themselves on knowing camp cookery; and certainly in the woods a good cup of coffee is a special boon. Even if a man knows no more than that he should bring water separately to boil and then pour it over the coffee placed in a dry coffee pot, and then let the pot simmer for five or ten minutes, he is going to give his camping companions a pleasant surprise, because they are so used to the old, ignorant method of putting coffee into cold water and letting it come to a boil. Even the drip method is easily applied on a camping trip. Use a square of muslin (fresh each time), place over the top of the coffee pot and let it sag, then add the water to drip. Certainly there's nothing complicated about this, and the reputation a man gets as a magic coffee maker will make the native guide and his terrible hard-boiled method sick with envy.

Coffee Finishes the Meal

IT is a fact that for large numbers of people an entire meal is a success or a failure, according to the success of the coffee. Certainly hotels, which have genuinely good coffee, get a generally good reputation for food, and *vice versa*. Naturally also, the cook and the housewife experience the same thing. If their coffee is good, much is forgiven, and if is bad, the best of cooking is often damned. Surely with such a psychology it is folly for anyone to flivver with coffee, when a flivver is really so unnecessary.

In AMAZING STORIES For February

THE EXPLORERS OF CALLISTO, by Harl Vincent. Generations of men have lived their span of life, but no one has ever seen the other side of our satellite. This well-known author has proved his ability to write of space travel before and he easily holds his reputation with this story. We can also promise a sequel for it.

BEYOND THE GREEN PRISM, by A. Hyatt Verrill. (A sequel to "Into the Green Prism." In 2 parts.) Part II. Mr. Verrill not only answers satisfactorily all the questions raised in the first story and in the first instalment, but has built another tale of ancient Indian civilization, which is of absorbing interest. Concluded in this issue.

THE ICE MAN, by William Withers Douglas. We have had a number of stories dealing with the impressions of a plausible future civilization and we have always thought it would be interesting to know what reactions a Roman, for instance, of ancient Rome, would experience if he were suddenly brought into the midst of our "modern civilization." Our new author gives us his idea of this in a cleverly written story, which, among other things, has a good touch of Edgar Allan Poe about it.

VITAMIN Z., by William Lemkin, Ph.D. The author of "Cold Light" now treats the most important subject of vitamins. And because he is a scientist, has a good imagination and the art of story-telling, you will like learning about vitamins and you won't think his Vitamin Z impossible. The story reads exceedingly well and is quite plausible.

THE MAN FROM SPACE, by L. Taylor Hansen. A unique story on interplanetary travel that shows a good deal of ingenuity, clear thinking and good writing. The author has obviously used good authorities to aid him in this work, for he offers some exceedingly interesting treatment of the stars and novae.

And several other stories of unusual merit.

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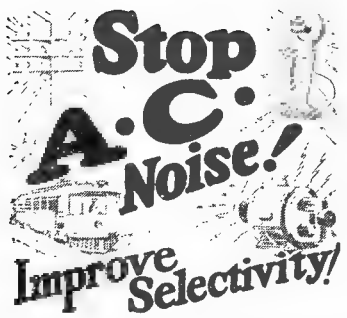

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Making Airports from Mud

By H. Winfield Secor

(Continued from page 883)

engineering than the Secaucus Airport. Long Island Sound, on which this seaport is built, is noted for its treacherous currents and its rough water. A hill 55 feet in elevation stands on the part of the site of this seaport, which is located at Astoria just across the river from Manhattan. This hill is to be cut down to 20 feet, and the method of doing this is far more interesting than the statement itself. A set of three huge electric pumps draw water from the bay and pump concentrated streams of water against this hill, washing the earth in semi-liquid form down to the level of the water. Sump holes are located nearby, into which the earth, in mud form, settles. From these holes the mud is sucked up and pumped through pipes into the bay. Another set of electric pumps do this work. A bulkhead has been erected at the required distance from the shore and the mud is allowed to settle behind this, thus extending the shore line to the desired distance. For the carrying of water to the hill, three sets of electric pumps of 750 horsepower each are mounted on floats, which may be moved to any point about the bay. Three sets of electric pumps of 300 horsepower each are used to draw the mud from the sump holes and pour it through 27 inch diameter pipe lines into the bay.

This airport at North Beach will be especially convenient to New York City, as it can be reached using a motorboat in 15 minutes from the very heart of the city. This airport, like the one at Secaucus, N. J., will have facilities for the manufacturing and displaying of aviation accessories. Besides this, it will have a system of pneumatic tubes for the rapid relaying of mail from the airport to New York City. The cost of these two projects is estimated at $10,000,000.

Remote Station Selector of Simple Design

By Jos. Attardo

(Continued from page 922)

numbered 43. If we want to listen to WLW, which corresponds to button 25, we first close the on-off switch. This allows the current to pass into the motor, which is geared direct to the condenser shaft of the receiver. With the motor driving the condenser we press down button 25. This closes the contacts at 21, and as the rotating switch point, 18, connected to the condenser shaft, reaches contact 19, a circuit is established leading to the electro-magnet 53. The magnet exerts an attractive force on the lever 50, which in turn opens the motor contacts and stops the motor driving the condensers. At the same instant the action of the magnet is transmittted through a lever, 61, to the second set of contacts at 63 and closes them; these are connected to the loud speaker circuit, and thus the speaker is not "alive" until the station has been "tuned in."

Any other station may be tuned in, by merely pressing the corresponding button. But it is necessary at some point to reverse the condenser when the plates are out of mesh. I accomplish this by a relay which comes into play automatically at a predetermined point at the end of the scale. If the old type condensers are used, this relay is not necessary as the plates can be completely revolved.

As may be seen from the above description, the design and idea of this station selector is comparatively simple.

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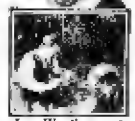
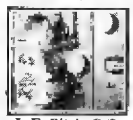


Leo Woelkers of Scranton, Pa., makes $110 a wk.



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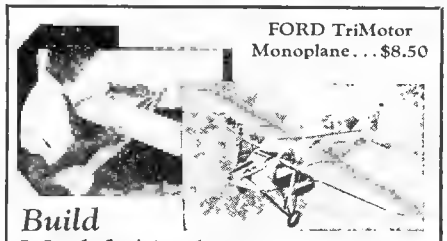

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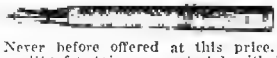

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One Man Plays 800 Instruments at Once

(*Continued from page* 884)

touch manuals, which permits the phenomenal resources, that include nearly every known musical instrument, both ancient and modern. Each of the five manuals of keys has a double touch that multiplies its sound possibilities. Through its intricate mechanism, which covers both walls of the palatial theatre, nearly 800 instruments can be called into play. Wurlitzer, the organ builder, considers this instrument his masterpiece. Henry Murtagh, one of the great pipe organ virtuosos, who supervised the installation of this great music machine, believes that organ building has reached such a state of mechanical perfection that most literature written for the organ is commonplace compared to the possibilities of the majestic symphonies hitherto regarded as beyond the scope of the pipe organ. Its next improvement will have to be the contributions of symphony composers, who will compose exclusively for the organ, he says.

How to Make Artistic Boudoir Lamps

(*Continued from page* 915)

specified on the drawing to form a box structure. The sectional views on the drawing also serve to show how the joints are made. The top of the base is then soldered to the box section of the base, soldering also being done from the inside. The next step is to solder the box section of the column to the base, soldering again being done from the inside, providing a suitable iron is available to reach through the column.

The base has a flange wide enough so that felt can be glued to it and thus prevent marring of the surface on which the lamp rests. By using a small soldering iron, bent at right angles to the handle, this base can also be soldered from the inside. After it has been soldered, the felt can be positioned and the top is then the remaining part to be assembled.

A hole should be drilled in the center of the top section and may also be provided with a ferrule or bushing to insulate the wire and to prevent chafing. The top of the column should also be drilled and tapped to take a small brass fitting which is held in place by machine screws and to which the lamp socket with pull chain switch can be attached. These fittings and the sockets can be secured in any electrical supply store. The top should be attached to the column, preferably by soldering from the inside because, soldering all joints from the inside, the outer appearance is maintained and there is little danger of the white metal being heated sufficiently to injure the exposed surface.

When the lamp is completed, the copper surfaces will appear as shown by the heavy lines on the drawing and the surfaces shown by the cross section lines will be of white metal. This provides just enough white metal to offset the copper surfaces and makes a very attractive appearance if time is taken to polish all surfaces carefully.

The lamp sockets are mounted upright as shown on the photograph of the completed pair of lamps. Any type of shade may be used to blend with the color of the lamp bulb, the shades being supported from the lamp bulbs.

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City Mail Carriers
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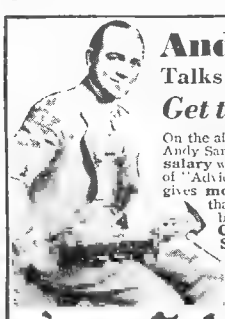

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A Mythological Cross-Word Puzzle

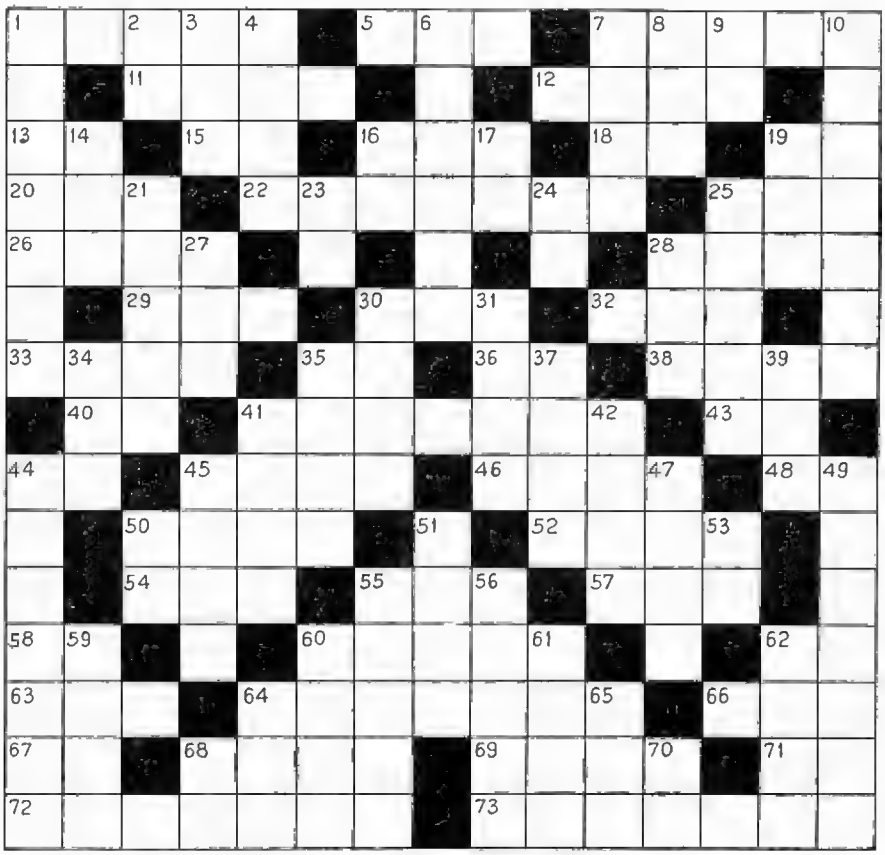
By Richard H. Tingley, C. E.

ACROSS

1. Trojan, king of Homeric legend.
5. The constellation of Aries, first sign of the Zodiac.
7. Greek musician who was said to have been thrown into the sea, and to have been carried ashore by a dolphin.
11. Giant demon of folk-lore who devoured human beings (Simplified spelling).
12. A long-legged, long billed bird worshiped by the ancient Egyptians.
13. Greek goddess of earth, mother of Uranus, the Titans and Cyclops (One way of spelling it).
15. An alleged force said by some to pervade all nature.
16. That portion of the world ruled by Poseidon or Neptune.
18. Ejaculation made to frighten.
19. Mystic ejaculation representing the name of the Supreme Being uttered by Hindus on solemn occasions.
20. A large extinct bird.
22. Daughter of Agamemmon, who has been placed in the sky as one of the Pleiades "the lost Pleiad."
25. A subdivision of a clan in ancient Laconia.
52. Patron saint of sailors whose weird, uncanny light is sometimes seen on the masts and spars of ships at sea.
54. Diminutive of Isaac.
55. A prefix meaning "through."
57. A poetic use of "over."
58. The, in French, masculine gender.
60. The household gods of the ancient Romans.
62. Abbreviation for "Post script."
63. The constellation of the Lion, the fifth sign of the zodiac.
64. The gods who presided over the families of Rome. They were placed with the Lares.
66. A weight used by Egyptians.
67. One of the chief places of Moab as may be seen by reference to Isaiah xv—1.
68. The Bishop of Rome.
69. One of the landmarks on the boundary of Zebulon (Josiah xix—13).
71. An Egyptian sun god reputed to be an ancestor of the Pharaohs.
72. In ancient geography, a city of Argolis in Greece, conspicuous in mythology.
73. Daughter of Zeus, twin and sister of Apollo, identified with the Roman Diana.

DOWN

1. In classic myth, a race of dwarfs said to have fought with cranes.



26. The principal goddess of the ancient Egyptians—wife of Osiris.
28. The Greek goddess of discord.
29. Greek spirit of malicious mischief who incites men to crime.
30. During the wanderings of Odysseus (Ulysses) after the Trojan War he called on Circe, the enchantress, who transformed each of his men into an animal, ——. What animal?
32. A prefix denoting "three."
33. Poses.
35. A brother of Odin of Norse mythology.
36. An abbreviation for "Ante meridian," "Anno mundi," etc.
38. Incalculable periods of time.
40. An ejaculation evoked by sudden emotion.
41. A sanctuary dedicated to Hera, the queen of the Olympian gods.
43. An ancient city in Egypt, generally thought to be Thebes, whose name will be found in Jeremiah xlvi—25.
44. One of the Norse gods who dwelt in Asgard. He is generally considered the opposite of "Vaa."
45. Greek mother of Castor and Pollux whom Zeus deceived in the form of a swan.
46. The continent on which it is assumed stood the "Cradle of Mankind."
48. The first note of the musical scale.
50. A military division of ancient Sparta.
2. Greek maiden turned into a heifer by the jealous Hera. An island, a sea and a country have been named after her.
3. Time past.
4. A member of an ancient Asian race from which came the "Three Wise Men of the East."
6. One of the three Furies of Roman mythology.
7. Father, an invocation to God (Mark xiv—36).
8. River. An element in many geographical names derived from Spanish.
9. An ancient city said to have been on the Euphrates rivers in Babylonia.
10. Greek goddess of retributive justice.
14. Greek goddess of dawn, referred to by Homer as "The rosy-fingered."
16. Prefix denoting "apart."
17. Near.
19. A fetish or charm.
21. A place in Palestine (Isaiah x—28), said to be the same place as "Ai," mentioned in Joshua vii—2.
23. Fifty-five.
24. Egyptian god of the midday sun.
25. A famous giant hunter of Greek mythology accidentally slain by Artemis. The hunter may be seen in one of the best-known constellations.
27. Abbreviation for "saints."
28. Before.

30. Queen of the Olympian gods, wife of Zeus. The generally accepted spelling.
31. Greek goddess of earth. Mother of Uranus, the Titans and Cyclops. Generally accepted spelling.
34. Island in the Aegean sea named after one of Zeus' lady friends. Its modern name is "Nio."
35. The holy books and collections of hymns of the Hindus.
37. One of the goddesses who presided over poetry, art and science.
39. The "Land" to which Cain is said to have fled after he murdered Abel (Gen. iv—12-16).
41. One way of spelling the name of the wife of Zeus, queen of the Olympian gods.
42. Island in the Cyclades group in the Aegean sea where a famous statue of Venus was discovered.
44. The cave in which King David hid from Saul (1 Sam. xxii—1) and (2 Sam. xxiii—13), from which the "Three mighty warriors" dashed out to get him a drink of water.
45. An evil giant god of Norse mythology.
47. Egyptian name of the god "Ammon."
49. Son of Agememnon who killed his mother because she murdered his father.
50. The third note of the musical scale.
51. A star in the constellation of Cetus.
53. Gold used in heraldic ornamentation.
55. One of Zeus' lady friends; mother of Perseus.
56. Volcano in Sicily; old form of spelling.
59. Weird, awe inspiring.
60. In Hindu cult, the wiping of the hands as a sacrifice to remote ancestors.
61. A person said to be able to foretell the future.
62. A fairy or elf of Persian myth.
64. A woodland spirit, half goat, half man, inventor of the reed-pipe.
65. Abbreviation for the name of the planet that has rings or belts around it; named after the Italic god of seed-time and harvest.
68. The seventeenth letter of the Hebrew alphabet.
70. The fifth letter of the Hebrew alphabet.

(Solutions on page 964)

Tips for The Young Machinist

By George A. Luers

(*Continued from page* 912)

THE ends of the bar of steel to be turned are fitted with conical centers, these points being the pivoting surfaces in which the work swings in the head and tail-stock center pivots of the lathe. To turn a true diameter, these conical centers must be accurate and remain so throughout the turning operations. Three faulty center bearings and one correct center bearing are shown by illustrations under Fig. 4. In the view at "A" is a small drilled hole used as a center bearing. This is not good practice, as the pressure of cutting soon makes the center loose in the pivot point. As the metal gives, the shaft may shift sideways and loss of accuracy results. In the sketch at "B," Fig. 4, a prick-punch center bearing is indicated. The fault in this is the tendency of the work to float off center on the point of the lathe center. If the work is not held in alignment with the center drill an angular hole results, as shown by the lower left view in Fig. 4 at "C." Insufficient contact with the center points will frequently cause failure in this and faulty turning results. Make the centers as shown in the lower right-hand view at "D," figure 4, and the resulting work will be dependable. Always keep the centers lubricated, white lead and tallow mixture being a proven lubricant.

For long flexible parts being turned, even a steady rest is not sufficient and some other means to support more nearly in line with the tool and resist its pressure is required. A follow rest as indicated by Fig. 5, has this facility. This is a support having two fingers adjustable by means of screw jacks. The follow rest is bolted to the transverse member of the lathe carriage, and thus follows the carriage. The fingers are to the rear of the tool, so close as to prevent any spring in the work. Often an angle bracket with a brass "V" block is bolted by C clamps to the carriage so to be opposite the cutting tool.

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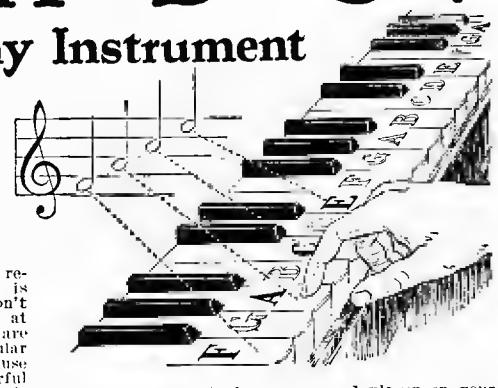

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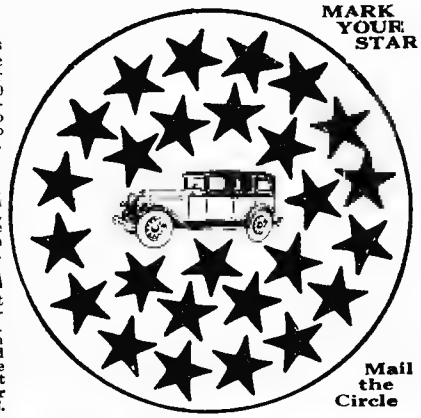

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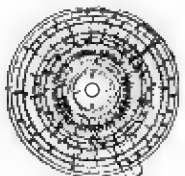

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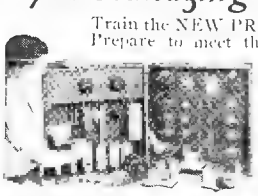

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When the Fates Fooled Ching Ling Foo

By Dunninger

(*Continued from page* 888)

native shores and came here where they appeared for many weeks as the feature attraction on the Victoria bills. Always a real performer, showman and second to none as a modern miracle man, Foo became an overnight vaudeville sensation.

The troupe of fifteen experienced conjurers that Ching Ling Foo headed, startled even the host of American professional magicians and electrified our theatre-going public from the very beginning.

Chinese magic, seldom seen here, at once "caught on" and the clever Chinaman continued to work hard and create new effects that made the country ring with his name. Naturally there sprung up a number of "Chinese" illusionists, but they were considered by the booking men as just another space filler on a vaudeville bill.

Knowing from past experience that it always pays to be original, Foo toured the country with his company, raking in the golden shekels he had dreamed about in the days when he played before his own countrymen and the European audiences.

Ching Ling Foo's specialty was the production from *empty*, beautifully painted and embroidered shawls and flouards various sized glass bowls contained live goldfish. After convincing his spectators that he had nothing concealed about his person, Foo would turn a complete somersault and immediately after, produce a large bowl containing water and goldfish. This effect alone used to bring forth great applause.

The old saying has it—"be it ever so humble there is no place like home," and Foo longed for the rice-fields of his Flowery Kingdom. Soon the plaudits of his audiences held but little charm; his work was mechanically done. He longed to return to his native land.

Ching Ling Foo, with his company, returned to their homeland, carrying with him untold wealth. But as he once explained to his friend Harry Kellar, he was not unappreciative of the manner in which the American theatre-goers welcomed him.

About this time, in England, another "Chinese" conjurer made his début. Immediately this mysterious newcomer who was known under the stage *nom de plume* as Chung Ling Soo, in his act outshone the originator of that line of Chinese magic. For sometime, even in magical circles, much speculation was in the wind as to just who this mysterious Chung Ling Soo was.

Time went on and English theatre-goers showered this superior magician from the Flowery Kingdom with applause and filled his coffers with golden coins. Gradually it leaked out through unknown sources that the Chinaman who was startling England was an American, well-versed in the art of make-up. Finally it became whispered in inner channels that Chung Ling Soo was none other than William G. Robinson, a clever illusionist and character actor from Yankeeland. Soo's getup and the make-up of his assistants was as near perfection as possible. Robinson even went so far as to allow himself to be interviewed, through an interpreter, by members of the British Press. His London home was fitted up in true Oriental manner with hanging lamps, rich Chinese tapestries, and whenever the gentlemen of the press were visiting him, the pseudo-Chinaman received them in this intriguing Poppyland setting.

A humorous tale is related of Chung Ling Soo in which he was being inter-

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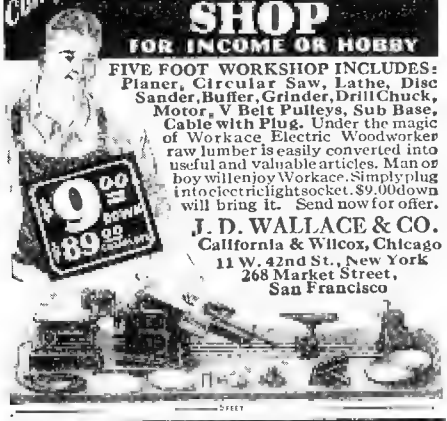

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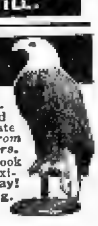

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viewed by several reporters. "Do you like this country?" asked one of the scribes. The real Chinese interpreter, who was an acrobat and trusted assistant of Soo's, made answer, "I do. They are kind, generous and know as much as I do of my magic art."

"Have you ever been to America?" queried the other representative of the Fourth Estate.

"No," the interpreter translated, "but in my dreams I see large buildings and much water. And standing in a bay I see a large statue with one hand upraised holding the torch of light, lighting the way to freedom."

"Do you expect to return to America?" asked the skeptical newspaperman.

"How can one return to a place one has never been?" fenced the inimitable Billy Robinson, through the interpreter.

Several times during the engagement in England, Soo was invited by wealthy Chinese residents to attend social functions. Knowing full well the outcome of accepting any of these the psuedo-Chinaman refused under the excuse of pressing work and preparation of new effects but always had the faithful assistant see those who wished to interview him first.

The original Ching Ling Foo soon grew tired of the life of a Chinese country squire and the lure of the footlights began to assert itself. Then came to him in his celestial homeland reports of another who not only adopted a portion of his name but who was astounding audiences with many of his feature tricks.

Oriental brains began working. Foo issued a challenge to Soo. In 1905 during the month of January, Soo took up the "hat in the ring" edict and presented himself in the offices of an English newspaper to meet and outskill the skilled Foo. Robinson, alias Chung Ling Soo, had no other alternative. For an hour or more he entertained the news clan with magical tricks, awaiting the arrival of Ching Ling Foo, but the fates and the keen Oriental mind decided differently.

On the following day the newspaper office received a letter from the original Ching Ling Foo, announcing that he (Foo) would meet and take up the challenge with Soo only upon the condition that Chung Ling Soo appear before the Chinese Consul in London, and prove his claim to being a real Chinaman. This naturally never took place and was soon forgotten by the readers of the papers. They had seen Soo and voted him the cleverest of Chinese wonder workers and that was enough.

Billy Robinson was a friend of all who intimately knew him. He was an ingenious inventor and a skilled prestidigitator. He was a make-up artist of remarkable ability and an actor to his fingertips.

I still have and value very highly a fishing pole trick he presented me with while I was in England. This is one of the two tricks that won him fame.

The other was the illusion he created when allowing several soldiers to fire rifles at him and he would catch a marked bullet between his teeth. This trick startled all who witnessed it and finally was the cause of his death. Through some carelessness on the part of one of his assistants the faked bullets or cartridges that went into the guns and were fired at him, one of these was switched for a real bullet. That night, standing bravely before the firing squad, Billy smiled in his inimitable way and the rifles were fired. Robinson swayed a moment and then collapsed to the stage. The curtain was hastily rung down but when medical aid reached this sterling performer Chung Ling Soo was no more.

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I urge you to get in touch with me and tell me frankly what weakness is annoying you and unfitting you for life's duties.

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..Rupture	..Overweight	..Round Shoulders
..Thinness	..Weak Back	..Stomach Disorders
..Pimples	..Weak Eyes	..Increased Height
..Insomnia	..Short Breath	Muscular Development
..Impotency	..Weak Heart	..Great Strength

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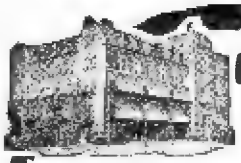
Age ..... Occupation .....
Home Address .....
City ..... State .....



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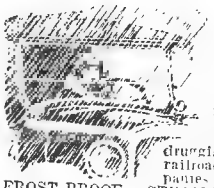

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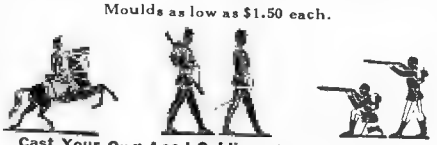

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And so another master magician passed over the border to the land from where there is no return.

* * *

During one of Ching Ling Foo's performances he had to call on an assistant not familiar with the workings of a certain production trick, in which the conjurer holds a cloth before a tray, and when the covering is whisked away two large bowls, filled almost to the brim with water, in which goldfish merrily swim about, stand on the tray. This trick was worked by the assistant who had the bowls hung from each side of his vest under his flowing outer garment. The bowls are covered with tight-fitting caps which are taken off quickly as the bowls are placed upon the tray by the assistant under cover of the cloth. This assistant foolishly began to fumble with the water-proof cap on one of the goldfish containers and the water in the bowl leaked down his wide trouser-leg. You can picture his predicament under such a trying condition. But the assistant was game and with true Oriental stolidness he stuck to his post until the production was made, and then slowly walked off the stage carrying the tray and bowls with a stream of water flowing, which the strong lights made more noticeable than it otherwise would be. The audience howled their glee and stern Ching Ling Foo had to turn his back, for things of a humorous turn were very much enjoyed by this Celestial wonder worker.

The writer has a very interesting letter in his possession, sent to him some years ago by the late Harry Kellar, which describes a rather interesting and amusing episode that Kellar experienced with Ching Ling Foo. Foo, at the time, was visiting the aged magician, at his home in Los Angeles. Kellar had equipped his apartment with the necessary electrical wiring, whereby he would operate what was known as a talking skull. An induction coil, and a transmitter concealed in this papier maché skull, would produce voices, which in reality were those of an assistant in another room, speaking into a wireless telephone. For this occasion, Kellar had a Chinaman concealed in another room, who spoke through this apparatus, when Ching Ling Foo was listening in. So uncanny was the instance to Foo, that he turned white when the spook of some departed Chinese soul began conversing with him. In fear, he dropped the skull, and started for the door. Dropping the apparatus put the mechanism quite out of order, but this factor did not upset Kellar, as he writes that the laugh was worth it.

SOLUTION TO PUZZLE ON PAGE 960

P	R	I	A	M	■	R	A	M	■	A	R	I	O	N
I	■	O	G	E	R	■	L	■	I	B	I	S	■	E
G	E	■	O	D	■	S	E	A	■	B	O	■	O	M
M	O	A	■	E	L	E	C	T	R	A	■	O	B	E
I	S	I	S	■	V	■	T	■	A	■	E	R	I	S
E	■	A	T	E	■	H	O	G	■	T	R	I	■	I
S	I	T	S	■	V	E	■	A	M	■	E	O	N	S
■	O	H	■	H	E	R	A	E	U	M	■	N	O	■
A	S	■	L	E	D	A	■	A	S	I	A	■	D	O
D	■	M	O	R	A	■	M	■	F	L	M	O	■	R
U	■	I	K	E	■	D	I	A	■	O	E	R	■	E
L	E	■	I	■	L	A	R	E	S	■	N	■	P	S
L	E	O	■	P	E	N	A	T	E	S	■	K	E	T
A	R	■	P	A	P	A	■	N	E	A	H	■	R	E
M	Y	C	E	N	A	E	■	A	R	T	E	M	I	S

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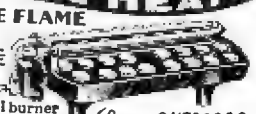

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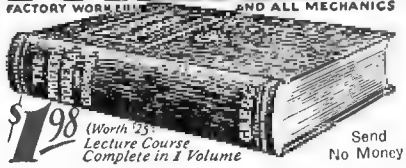

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Human Nature and the Stock Market

By Alfred M. Caddell
Financial Editor

ONE of the most frequently indulged in and yet one of the most valuable things that people do is to hold post mortems on current events. Some post mortems are ridiculous and of exceedingly light weight, as for instance several which emanated from "authorities"—the proper term would be publicity seekers—on the recent stock market crash. Most of these "authorities" were as one in proclaiming that values *had been stepped up too high* that the credit structures *had become inflated*, etc., etc., *ad nauseam;* and yet a perusal of the newspaper files extending back from a week to a few months prior to the break discloses these same authorities openly advocating the purchase of stocks at levels which sane bankers and keen speculators shuddered at.

But post mortems that convey honest and intelligent reflections of lessons learned are of inestimable value to mankind, whether they are reviews of a war, a panic, a political election or what not. And as one writer on financial subjects pointed out, one of the most profound lessons learned from the recent tumble in security prices is that human nature is still human nature.

At first sight it would appear that the ups-and-downs of security values was distinctly a matter of finance. But the most successful investors or traders do not think in terms of finance at all—they think and conduct their operations in terms of human nature. And their judgment is seldom wrong.

Shortly after the recent precipitate drop in security prices, the writer happened to observe an incident that portrayed mob-psychology playing a rôle similar to that exhibited in the market crash. At the Grand Central Station in New York there is a long, sloping passageway leading to another subway line. It was being traveled by many people homeward bound from their daily work. Without any warning, a boy started to run rapidly down the incline. A second boy joined him and then a man and another man and another man and then a woman and another woman and another woman until everybody seemed to have joined in the stampede. There was absolutely no necessity for it and none of them could have advanced any reason for it.

No one can become really successful in business or finance if he does not recognize this trait of human nature. When the founder of the House of Rothschild was seen buying rentes at panicky prices at the time the streets of Paris were reeking in the blood of the Revolution some one expressed amazement at his courage. "But I am convinced these rentes are cheap," replied Rothschild. "If France survives this crisis they will be valuable, but if France does not survive neither your money nor my money will be any good." In other words, Rothschild reasoned the situation out intelligently, and profited millions thereby.

Immunization from fear, and courage to act forcibly when things look darkest, constitute the basis of most American fortunes. B. C. Forbes tells us that Commodore Vanderbilt exercised the utmost fearlessness in times of emergency: that John D. Rockefeller first won his foothold by going unflinchingly ahead when others were torn by doubt; that the Carnegie fortune was built up mainly during crises when his associates, alarmed by appalling losses, insisted on selling out to save something from the wreckage. Carnegie, keeping cool, could see beyond the storm and risked his money because of his sturdy faith that the sun would shine again by and by. Henry Clay Frick be-

(*Continued on page* 968)

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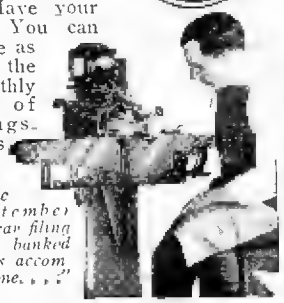

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Human Nature and the Stock Market

(*Continued from page* 965)

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Questions and Answers

Edited by Alfred M. Caddell

Financial Editor

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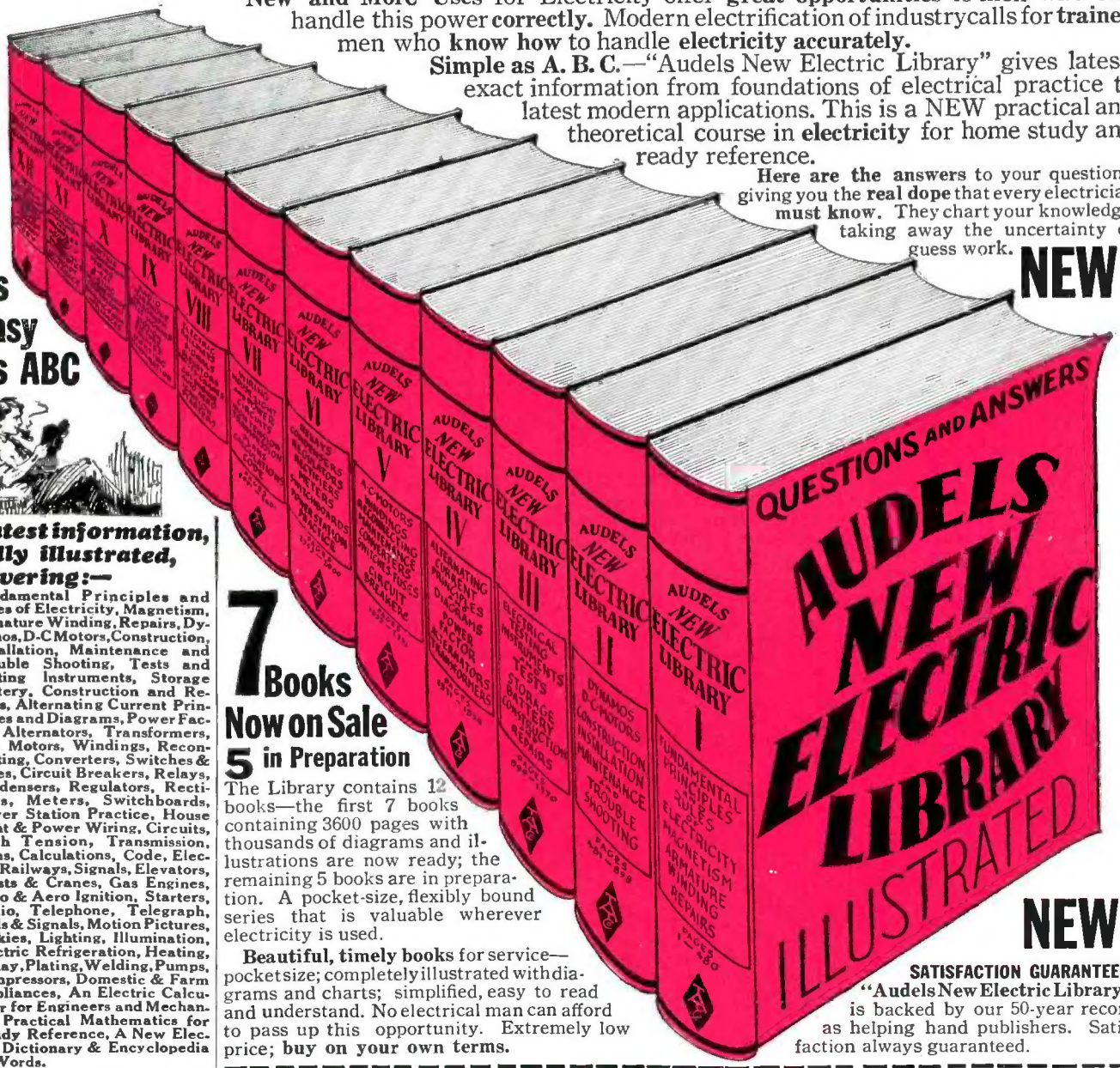

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The Inkograph fully justifies all claims you make. I own a Waterman but Inkograph is far preferable. Frank R. Sargent, Oakland, Calif.

You have one of the best writing instruments I ever used regardless of price. I use the lowest grade stationery and there is never a blotch or scratch because of it's round smooth point. It is a wonderful invention. H. L. Orley, Albano, Va.

Oh, boy, I am tickled skinny to have the Inkograph, it's a darling. I can now make carbon copies in taking orders and send originals in ink to factory instead of a penciled sheet. It surely flows over the paper as if it was grease instead of ink. No trouble at all and a thing I could not do before to trace straight lines very fine and clean. No smear, no muss of any kind. It's just great. E. A. Simms, Jersey City, N. J.

My Inkograph is the smoothest writing instrument with which I have ever written. That is saying a lot. I am a teacher by profession. I have a $7.00 pen and another that cost more than the Inkograph, but Inkograph is better than either. It is the greatest improvement in writing instruments since the Babylonians recorded their thoughts on clay tablets with a triangular pointed reed. John R. Atwell, Chadwick, N. C.

My Inkograph is the first and only writing utensil I ever owned that I can use with pleasure. To be without it for any time would upset my business day. It has always worked perfectly. I have never had any dificulty with it. Arthur L. Fox, Centerville, Mich.

I am a bank teller, have used all kinds of fountain pens, but can honestly say for my work I never found a pen so easy and tireless to write. You can pick it up any time in any position and write immediately and all numbers and words will be the same. Try and do it with any other pen. My buddies all agree that it is best for our work. C. R. Morley, Allentown, Pa.

Delighted. It writes bully—you have invented a pen that is perfection. It is so much more rapid than my $9.00 fountain pen. I wish you abundant success. S. L. Carlton, Aurora, Ill.

I am very well pleased with my Inkograph. It is just what I have been looking for. I have had several ink pencils but nothing like the Inkograph; it writes like the point was greased and it makes no difference what kind of paper, it is fine for shipping tags. S. I. Jarrett, Harrisville, W. Va.

The Inkograph, I am thoroughly convinced, is the best writing instrument I have ever used. It is sure, sane and clean and always ready to use. I am very well pleased with it. J. E. Rampton, Pensacola, Fla.

Your Inkograph is everything you state. It is just wonderful. So send me two more. Arthur Olcott, Tucker, La.

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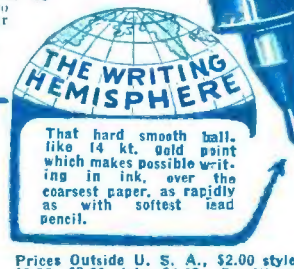

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